MILK LINES: TAINTED HEADWATERS OF HERITAGE

by

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ABSTRACT

Mothers, through their delivery of breast milk to developing infants, are consistently portrayed as nourishing figures who endow the sacramental gifts of love and health upon their children. Using scientific studies, I catalogue the emotional and physiological benefits of breast milk, but I subsequently move toward the complications of "mother-as-nurturer" in light of the litany of foreign contaminants now found in human milk. I expose and explicate the potential harm of contaminated breast milk upon suckling infants, and suggest that the depiction of the nurturing and nourishing mother figure must be reconsidered as evidence of synthetic chemicals in milk emerges. Modern mothers now occupy separate realms: they are caring and contaminating. I frame my work through a personal understanding of my mother as a contaminated woman, and consider the ways in which my lineage—a lineage embodied in breast milk—is tainted by chemical pollutants and their migration into my own breasts.

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Milk is in our blood.

We are of a common material. According to Greek Myth, Zeus brought the infant Heracles, born of another woman, to his sleeping wife, the goddess Hera. Wanting to ensure his child's success, Zeus pressed the infant's mouth to the goddess's breast. Instinctively, Hera began to nurse the child. As Heracles took in Hera's milk, he was endowed with divine properties that would guarantee his future greatness. His appetite so roused, Heracles bit down on Hera's nipple, causing her to writhe in pain and throw the boy from her lap. Her milk continued to spurt wildly out of her breast, streaming out into the distant sky and forging the Milky Way Galaxy. *Galaxias*, from the Greek "milky." From our inception, we were bathed in mother's milk, our origins born of injury, ignorance, and deceit.

I

VISION

There is only one real deprivation…and that is not to be able to
give one's gifts to those one loves most.
~May Sarton, *Journal of a Solitude*

If you want to read my toxic memoirs, look inside my breasts. The twentieth century tells a chemical story: poisonous narratives routed through our industries, embedding themselves in the channels of our lives. Because of their structure and internal design—because of my architecture—my breasts are the nucleus of this landscape of contamination. The magnitude of chemicals finding their way into our food sources, into our bodies, until we *become* food sources, fractures my spiritual course and my family lineage. It also threatens my own autonomy as a woman trying to navigate a chemical world. I fear that the milk I may one day yield will be my poisonous contribution.

Although most exchanges go unnoticed, we live in a time when our bodies interact with potentially harmful chemicals on a daily basis. There are currently 82,000 synthetic chemicals in use in the United States, with an average of three new synthetics entering the market every day.[1] *Every hour*, 1.75 billion pounds of chemicals are produced or imported into the US.[2] Chemicals are used by our industries, in our households, and for our convenience.

Of these tens of thousands of compounds, not all pose threats to our well-being, nor do they all accumulate at high enough concentrations to definitively threaten human welfare. However, endocrine-disrupting chemicals—EDs, synthetic and natural chemicals that alter animal hormone systems—contradict conventional understandings of toxicity and potential risk. Today, there are approximately one thousand chemicals that have exhibited endocrine-disrupting qualities.[3] Although this seems like a fraction of the compounds in use today, many known EDs are found as residues on foods we commonly eat, or as components of everyday products we use. They are plasticizers and flame retardants and pesticides. Endocrine disruptors impersonate biological hormones, like

estrogen, and can alter or inhibit hormone activity, leading to problems with intellectual function, sexual development, and the central nervous system.[4] What is distinctive about EDs is that they can operate at very low levels of concentration, where they avoid detection from the body's defenses. These are levels found in breasts, and in the milk they produce.

The contamination of milk, however, is a recent chapter in the story of the female body, and heralds a new way for me to perceive breasts. Writing as a lesbian (among many other things), my first impressions of breasts are admittedly not maternal in nature. Because of my sexuality, breasts are *of* me, but they are sometimes also objects of my desire. To appreciate the gravity of what it means to have toxic milk and toxic mothers, I have stratified new meaning upon old meaning, interpreting breasts—and their contamination— as a woman, a daughter, a partner and, perhaps, a future mother.

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Breasts: upon them collapses the symbolic and the material, the delicate and corrupt. Breasts connote desire, sexuality, femininity, utility. They are sources of scandal and ornaments of pubescence. Breasts sell cars. They avert glances and welcome glances and are constantly on display in varying degrees. Even the absence of breasts causes controversy. In February of 2013, Facebook continually removed from its site an image of a cancer survivor's tattoo over a double mastectomy. The tattoo, taken from the book *Bodies of Subversion: A Secret History of Women and Tattoo,* is an elaborate floral design creating a cropped tank-top effect.[5] Facebook repeatedly deleted the photo, explaining that it violated the site's nudity policy, which "imposes limitations on the display of nudity" and is strictly against the "sharing of pornographic content."[6] But the

offending parts—the woman's breasts—had been removed from the body. The *idea* of the breast is apparently threatening enough.

Feminist academic Elizabeth Grosz suggests that "the only socially recognized and validated representations of women's sexuality are those which conform to and accord with the expectations and desires of a certain heterosexual structuring of male desire."[7] Evidence of Grosz's claim is found in the profitability of sexual breasts as advertising tools with their own designation. "Breastvertising" is a category of breast-focused advertising that, by definition, must cause distraction and "disruption of work."[8] A 2012 study in *Advertising and Society Review* estimates that 10% of television ads and 20% of magazine and Internet ads involve sexual images.[9] The sexual breast is also fodder for controversy, as "nip slip"—a euphemism for an accidental exposure of the nipple—has quickly made its way into the popular vernacular.

I cannot say my own desires neatly reconcile with the hypersexualization of women on television, nor do these images influence my consumer practices; rather, I am mostly discouraged by the blatant exploitation of breasts to sell products. However, male desires have likely influenced me in another manner: with an undergraduate degree in English, my literary encounters have impressed upon me a way to discern and *write* about the female breast. Simply, I have read a lot of literature written by men. These encounters have occurred through works like those of the metaphysical poets, who have sought to convey the body through verse, like John Donne in his "Elegy XVIII: Love's Progress." The contemplation of love, the poem suggests, is wasted effort unless the object of one's desire is distinct. A woman's virtues are found in the physical, not the spiritual. Donne searches for this object, as his description of a woman travels from her lips down to her

forest, finding "…strait Hellespont between/The Sestos and Abydos of her breasts,/(Not of two lovers, but two loves the nests)."[10] Breasts are mythical destinations, mythical towns separated by waterways, connected by desire.

In Andrew Marvell's "To His Coy Mistress," the speaker suggests that years are limited, so lovers do not have the luxury of time to wait for sex. Unencumbered by temporal reality, however, "An hundred years should go to praise/Thine eyes and on thy forehead gaze/Two hundred to adore each breast/But thirty thousand to the rest."[11] As the speaker spends time contemplating parts of his lover's body, one hundred years are spent on her eyes, but four hundred years are dedicated to her breasts alone. Ethereal love is circumvented by the material love of her body.

The awareness of the body in its detail is also exemplified in Robert Herrick's "Upon the Nipples of Julia's Breast": "Have ye beheld (with much delight)/A red rose peeping through a white?/Or else a cherry (double graced)/Within a lily? Centre placed?"[12] The breast has its own essence, as Herrick, through much of his poetry, sections-off the woman into pleasurable, observable parts. Her breasts, doubled graced, embody twice the virtue, also expressed in the virginal lily-white of her skin.

In each of these examples, breasts are structured through a filter of male design. Discourse of the sexual breast abounds, in popular culture and literature alike. And although breasts are layered with mythologies of sex, beauty, youth, and love, the biological usefulness of breasts preceded their sensual associations. My perception of breasts migrates. There is a physical vitality that runs through women, expressing itself in motherhood, demonstrating the grace and function that a maternal breast can exhibit. The mother's breast—the lactating, nurturing figure—occupies a separate realm of discourse:

same breast, different meaning. In many lives, breasts become accessories to motherhood and vessels of sustenance. The importance of breastfeeding is a movement inward, beginning with the sheath and arriving at substance.

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We are *of the breast*, at least since the eighteenth century. In 1758, Carolus Linneaus, the father of zoological nomenclature, introduced the word Mammalia in the tenth edition of his *Systema naturae*, and by "doing so, he made the female mammae the icon of that class."[13] *Breast,* from the German meaning "to swell" or "sprout." *Mammae*, from the Latin: breasts; *Mamma*, in Italian: mother. Retiring "quadruped" as our defining feature, our mammary glands came to define our biological branch. We are born of the mother and fed by the mother, as a woman's body becomes the first ecosphere; our sub-species looks to the mother for the first nutrients as part of the primary environment.

Evolutionarily, lactation had a profound effect on the food-gathering strategies of mammalian mothers, since they were able to feed their young without having to travel far distances in search of potentially scarce food sources.[14] This allowed mammals to lead rather unencumbered lives not devoted strictly to hunting and gathering for their infants, but also allowed the infants to grow faster because their energy was not being expended looking for food. The trait also gave mammals the ability to venture into unknown and potentially harsh environments because they could "persist in impoverished, disturbed or rapidly changing habitats,"[15] as infants survived on calcium and mineral stores in the mother's body. Our species owes much of its success to the "extraordinary phenomenon of lactation, just as it owes its name to the complex glandular apparatus that made that

phenomenon possible."[16] Our characterization lay not only in our physical structure, but also in the ways we rear our young.

Or, at least that is part of the story. Linneaus may not have predicted the semiotic diversity that breasts would acquire in the centuries to come, but he supposed the importance of lactation. Modern taxonomy has defined us as nursing beings, which (thankfully) sets us apart from the "creeping" reptile, the "spineless" invertebrate, or the "two-natured" amphibian.[17] And yet, the fact that there are some 5500 mammal species suggests that this fundamental attribute is *a* quality but not *the only* quality of our kind: it is one of many things we do but certainly not all that we are.

What our taxonomy more poignantly conveys is that breastfeeding is an aspect we highly privilege—it is a function we deem important. Our categorization as being "of the breast" indicates more about what we value rather than picking-out an essential feature of a genuine natural kind.[i] Through a European structure of classification, the act of breastfeeding has an important significance to our species, important enough to define an entire taxonomic class. And thus, what sets us apart, what elevates lactation in our human lives, has been the stratification of importance and value upon the act of breastfeeding: we have layered interpretation onto function. The significance of breastfeeding simultaneously occupies two spheres—the scientific and the symbolic. Meaning converges upon the mother's breast.

For me, a Roman Catholic defector, breastfeeding evokes a sensibility of sacrament, both in the act itself and through its symbolic representation. Catholic sacraments are physical demonstrations of grace, divine life endowed upon us. Breast

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[i] For further reading on the pluralisms regarding natural kinds, see John Dupré, "Is 'Natural Kind' a Natural Kind Term?" *The Monist* 2002, 29-49.

milk is heralded as a miracle resource, the ideal nourishment for infants, and an avenue for postpartum restoration. Milk is bestowed upon infants as an act of a mother's love—as an act of *my* mother's love. For me, breastfeeding becomes religious ritual when rituals are hard to come by. Fundamentally, sacraments signal to Christians what is important. Based upon the taxonomy we accept and characteristics we privilege, breastfeeding, to us, is valuable. It is a value and a sacrament, a gift that is splintered when breast milk is rendered unclean.

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What is cherished is fractured. Inside our breasts, battles are fought. In every war there are foreign infiltrations, boundaries are breached while perspectives intermingle: an intake of violence, an exhale of agony. Contaminants are unwelcome invaders, as our bodies function more as porous membranes rather than impermeable defenses against the pollutants of our world. When it comes to chemicals, there is no safe inside that is protected by our outside. Perhaps environmental contaminants are the great equalizer: laboratory body burden tests, which measure the specific levels of chemicals in one's body at a given time, will reveal at least 250 chemical contaminants in a person's body fat,[18] regardless of whether she lives in Salt Lake City, Utah, as I do now, or in a remote village in the mountains of Southern Italy, where my lineage begins. But, costing upwards of $3000, the prohibitive price of body burden tests illustrates a potential disconnect between a contaminated population and their access to simple information regarding their own health.

As of 2012, the EPA's Toxic Substances Control Act (TSCA) released new standards that require chemical companies to make information regarding consumer

products and commercial applications of their compounds public. The TSCA addresses "pollution prevention, risk assessment, hazard and exposure assessment and characterization, and risk management."[19] The EPA claims its new standards will "ensure that EPA has access to the tools and resources it needs to quickly and effectively assess potentially harmful chemicals, and safeguard the health of families across the country."[20] These assessments, however, are only done after the chemical has already been approved for market. It is the same old dubious sequence: dump first, ask questions later.

The work of actually testing synthetic chemicals for human safety has been given to government and university researchers, but they are too often underfunded and poorly reimbursed. Their efficiency and capacity to evaluate all potential chemical threats is, it appears, problematic. Among the abundance of chemicals being tested, reviewed, and often approved, are persistent organic pollutants (POPs), which are compounds resistant to environmental degradation. These resilient chemicals ultimately find their way into the constitution of the modern human body, and take refuge within the breasts of women.

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From a deep ancestry of evolutionary amendments, breastfeeding has come to symbolize a sacred ritual for me, and rather than purely sexual objects or dishonorable representatives of biological threats and biological reminders of what we could or "should" become, a mother's breasts articulate a confluence of liturgy and the practical. While our breasts are tools of sacrament, they also hold the toxic trespasses of our ancestors, as yesterday's chemical practices are submerged within our tissues. My toxic writing is infused with chemical chapters of women who have come before me. My

legacy is something I carry within me, and before I pass it on, I must reconcile my desire to have children with my now-polluted lineage. I am part of a sisterhood of contamination.

The environment is not static, and within the material of the breast are elements of commerce and industry, synthetic compounds that make long migrations into the folds of our flesh. Some of these compounds are used in remote industrial operations, applied far from where we reside. But sometimes, distances contract. The EPA's Toxic Release Inventory Program, which monitors the US's most-produced chemicals, reported in 2007 that an average of 4 billion pounds of these high volume substances are discarded and released out into the environment every year.[21] Even controlled applications of these chemicals do not ensure their safe and controlled disposal. More alarmingly, it is not preventing their dispersal into our environments, where we live with them and take them in. *Potential toxins find migratory routes*.

Through these corporeal assaults, the mother transcends meaning, as she is reconceived through new frameworks. She is no longer strictly a nurturer, but occupies the realms of caretaker and contaminator. Modern breasts—and everything maternal they represent—tell a new story, and what is stored in their depths is part genuine, part synthetic. From a trajectory of passion to poison, the mother has been misinterpreted; she has her own secrets to spill.

Notes

[1] Anne Platt McGinn ,"Why Poison Ourselves? A Precautionary Approach to Synthetic Chemicals," *WorldWatch* 2000: 7.

[2] Rick Smith and Bruce Lourie, S*low Death By Rubber Duckie: The Secret Dangers of Everyday Things* (Berkeley: Counterpoint, 2009) xiv.

[3] Colborn, Theo, *TEDX: List of Potential Endocrine Disruptors*, 2 Apr. 2013.

[4] Wissem Mnif, et al, "Effect of Endocrine Disruptor Pesticides: A Review," *International Journal of Environmental Research and Public Health* 2011: 2267.

[5] Sara C Nelson "Facebook Removes Image Of Breast Cancer Survivor's Double Mastectomy Tattoo Over Nudity Violation," *The Huffington Post UK* 19 Feb. 2013.

[6] Zuckerberg, Mark *Facebook Community Standards* 2013 26 Mar. 2103.

[7] Elizabeth Grosz, *Volatile Bodies: Toward a Corporeal Feminism* (Bloomington: University of Indiana, 1994) 202.

[8] Jen Doll, "A Handy Glossary for Adweek's 'Breastvertising' Opus," *The Atlantic Wire* 4 Jun. 2012, 7 Jan. 2013.

[9] David Wallis, "The Breast of Advertising From Hooters to the Cover of 'Time,' Does the Strategy Sell or Repel?" *Adweek* 4 Jun. 2012, 7 Jan. 2013.

[10] John Donne, "Elegy XVIII: Love's Progress," *The Broadview Anthology of Seventeenth-Century Verse and Prose*, eds. Alan Rudrum, Joseph Black, and Holly Faith Nelson (Peterborough: Broadview Press, 2000), 118.

[11] Andrew Marvell, "To His Coy Mistress," *The Broadview Anthology of Seventeenth-Century Verse and Prose*, eds. Alan Rudrum, Joseph Black, and Holly Faith Nelson (Peterborough: Broadview Press, 2000), 834.

[12] Robert Herrick, "Upon The Nipple of Julia's Breast" *Luminarium*, 16 Jan 2013.

[13] Londa Schiebinger, "Why Mammals are Called Mammals: Gender Politics in Eighteenth-Century Natural History," *The American Historical Review* 1993: 382.

[14] Caroline M. Pond, "The Significance of Lactation in the Evolution of Mammals," *Evolution* 1977: 179.

[15] Ibid., 191.

[16] Daniel G. Blackburn, "Evolutionary Origins of the Mammary Gland," *Mammal Review* 1991: 83.

[17] "Reptile," "Invertebrate," and "Amphibian," *Online Etymology Dictionary*. 2012, 28 Feb. 2013.

[18] Theo Colborn, Dianne Dumanoski, and John Peterson Myers, *Our Stolen Future: Are We Threatening Our Fertility, Intelligence, and Survival?—A Scientific Detective Story* (New York: Dutton, 1996) 106.

[19] United States Environmental Protection Agency, *Chemicals: Scientific Review, Assessment*, 20 Mar 2012, 12 Feb 2013.

[20] United States Environmental Protection Agency, "EPA Makes Public Comprehensive Information on Use of Chemicals in the U.S," EPA 2 Feb. 2013, 16 Feb. 2013.

[21] United States Environmental Protection Agency, *2011 Toxics Release Inventory National Analysis Overview*, Jan. 2013, 8 February 2013.

II

VIRTUES

The spiritual virtue of a sacrament is like light;
although it passes among the impure, it is not polluted.
~St. Augustine, *In Johannis Evangelum*

Mothers surround us. *From* us, they are inseparable, like pillars from ancient temples, crests from ocean waves, or soil from under our fingernails. Mother: her role is mercurial. She can be biological, a ligament to our ancestry. She can be a surrogate, providing emotional nourishment. She can be allegorical—mother nature, motherland, Mother Mary. Mother: Her love is defined by the confidence she keeps and by the sacred gifts she relinquishes.

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I come from a long line of Catholic opportunists. We are women who have selectively extracted meaning from the Church's teachings to fit the occasion. My maternal grandmother, Maria Clorinda, temporarily moved from Italy to Canada to live with our family for two years when I was young. I would watch her sit in silence, eyes closed, and pray the rosary twice a day. Over two years, that's 1400 rosaries and over 77,000 Hail Marys. When I asked her recently why she became so devout, even though my mother maintains that she was never really passionate about church, my grandmother replied, "When you get closer to death you just become more religious." My paternal grandmother, Angela, used to attend Catholic service in her hometown in Italy, until one day, she slipped and fell on the way to mass. She said that if God wanted her to go to church, he wouldn't have let her trip. She never went back. My mother, Luigia "Gina," grew up active in the Church, taught catechism, and at age twelve was confirmed by Pope John XXIII when he was still the Patriarch of Venice. In high school, she was one of a group of just fifty people who won an audience with Pope Paul VI. After marrying a born-again agnostic (my father) and moving from Italy to Canada, she stopped attending church and became, by all accounts, outwardly unreligious. My own route has constituted

a steady divergence from the Church, or at least from whatever parts of the Church were instilled in me during my combined fourteen years of Catholic education funded by the Canadian government.[ii] I was baptized at five years of age, but only so that I could enroll in Catholic school, and the only masses I ever attended were monthly assemblies in the school gymnasium. All things considered, my religious lineage is obscure—or so I had supposed.

Sometimes, despite distance and disillusionment, teachings saturate, and once-concealed spiritual frameworks seep upwards towards the surface. Mother Mary—the Virgin Mary, the Madonna—is venerated in the Catholic Church, and her image as a central mother figure is of great significance. Despite my years of Catholic school and various pilgrimages to churches of antiquity—from St. Peter's Basilica to the Chiesa del Crocifisso in my father's hometown—the breastfeeding Virgin Mary is not a familiar motif. To my surprise, however, in the early days of Christianity, "the virgin's nursing breast, the lactating virgin, was the primary symbol of God's love for humanity."[1] A nursing infant was the bridge between the physical body and a sacred relationship with God. The oldest known image of a breastfeeding Virgin Mary is displayed in a Roman Catacomb, depicting the baby Jesus suckling his mother's bare breast[2]; another example is Bernardino Luini's painting *Nursing Madonna* from the sixteenth century (see Figure 1). Yet today, few paintings depict the Virgin mother breastfeeding her son, a fact that has largely been attributed to the printing press, an innovation that allowed for the mass-market reproduction of pornography. The movable type provided a means for the

[ii] In the province of Ontario, Canada, Roman Catholic "separate schools" have constitutional status, and, although publically funded, are operated by separate school boards with curricula reflective of Roman Catholic theology.

Figure 1: Bernardino Luini's *Nursing Madonna* from the 1520s, on display at the Pinacoteca Ambrosiana in Milan, is a rare depiction of the infant Jesus suckling the Virgin Mary's breast.

duplication and distribution of images of women, particularly anatomical drawings used for medical purposes, which promoted the sexualization and subsequent demystification of the female body, and "undermined traditional views of the body as a reflection of the divine."[3] The primary Christian symbol soon became the crucifix, while the lactating mother was marginalized and kept out of the church; a revered woman was replaced by a man. A new ethic of Christian suffering supplanted an ancient ethic of favouring vitality.[iii] Today, spirituality once characterized through physical life is illustrated by pain, and death.

This unexpected image made sense, and still, I felt as though the symbol had been kept from me. Similar to the crucifixion, the breastfeeding Mary demonstrates a corporeal understanding of spirituality. And just as the seven sacraments of the Catholic Church are physical demonstrations of God's grace—an expression of divine love—the act of breastfeeding is a tangible expression of the ethereal love of a mother. Breast milk is delivered as a gift, as an offering through lineages. Each feeding is a ceremony between infant and mother, a physical *communion* between people; it has equal meaning for giver and recipient. Mothers are conduits to the soul, as they deliver milk like a sacrament. Representing a ritual, breastfeeding brings us closer to God.

Of the seven sacraments, Communion is traditionally the second; for me, it was the first. It is a sacrament in which I have engaged, and it is likely the only such ceremony that I may one day again participate. My religious lineage is disjointed, and breastfeeding as ritual mends my fractured spirituality. Just as my mothers before me, I have found value in religion, as I use sacrament to gather the vestiges of my beliefs.

[iii] For a reading on the development of Christian ethics, see Friedrich Nietzsche's *On the Genealogy of Morals.*

Baptism

In 1983, I was at the top of the top of the food chain. I can only retrospectively relish my former rank because I was a mere infant when I occupied my elite position. Humans—along with large aquatic mammals and birds of prey—have the distinguished honour of being at the apex of the earth's food webs. Because of their diet and because humans have no direct competition from predators, human beings are at the peak. I remember posters of the food chain on the walls of my elementary school, with humans sitting atop a triangle of nutritional order. What those laminated diagrams never explained was that the breastfed child, because it feeds upon the matriarch of the food chain, occupies one trophic level above the rest. Therefore, while I would love to take the credit, my mother is largely responsible for allowing me to summit a great mountain when I was just hours into life.

Some newborns take several days to initiate suckling, and healthy full-term infants can live up to five days without milk, sustaining themselves on the fluids with which they were born.[4] I, however, began breastfeeding without delay, eagerly accepting my mother's milk in the same spirit in which it was given. I breastfed for sixteen months, a fact that has always caused me minor embarrassment while offering my mother a compelling conversation piece for friends and strangers alike. Perhaps because of my own insecurities, I imagined people taking pity on me for my inability to unlatch and become an independent feeder, but my mother is proud of my longevity at the breast, and I am grateful for her willingness to persist in this ritual long after others had switched to bottle-feeding.

Born and raised in Italy, breastfeeding was a way of life for my mother: "It is the

way I was brought up. That's the way you think," she explained to me. To my mind, this practice is ensconced in the deep Italian tradition of caring for the family above all else. My ninety-two-year-old grandmother, who still lives in Italy, recalled to me that mothers did not conceive of voluntarily withholding breast milk, and the only women who did not breastfeed were the ones who developed a dry nipple disorder called *Ragadi,* or whose milk production was low. (Methods to encourage milk production illustrate a generational difference: my grandmother remembers that mothers were advised to drink pigeon broth; my mother was advised to drink beer.) In her household in Puglia in the late 1940s, when bottle-feeding was only an afterthought, my mom was breastfed for about a year, the first four months on breast milk alone, and the last eight (as recommended by a doctor) on a mixture of milk and broth. Personal histories of breastfeeding constitute obscure facts that few people know about themselves, but facts that my mother can still recite, as can I. Perhaps it is these obscure elements of infancy recalled to us by our parents but long-forgotten in our own recollections that make up the innumerable fragments of who we are.

In the early 1980s, the breastfeeding initiation rate in Canada was at 60%, which followed a steady increase from the 25% rate in the 1960s.[5] Still, my mother recalled to me that she was a unique woman among her friends, all of whom chose not to breastfeed, touting it as a dated and unliberating practice. "They thought they were being *hip*," my mother said to me in a dismissive tone. What she really meant was that good mothers don't sacrifice their child's well-being for the sake of fashion, or for the sake of perky breasts. Consultations with a female doctor at St. Michael's hospital in Toronto recapitulated what she had known for years: breastfeeding your child is an investment in

their health that sustains well into adulthood. Instead of pitying me, those strangers should have been envious. The merits of breastfeeding lay both in the ritual it serves and the biological advantages it affords.

Eucharist

I was initiated into life by a physical fastening to my mother. For sixteen months, we were in collusion: an intimate web of give-and-take. Born by caesarian, my debut was forced, but I immediately took to the most natural form of nourishment. "Psychologically," my mother said, "there was a bonding that you don't get with bottle feeding." Taking up her seventeen weeks of maternity leave and three weeks of accrued vacation, she established a time for mother and daughter to grow together. We now live 3,000 miles apart, but those miles contract when I remember how our individual odysseys began as one.

Despite the storied history of breastfeeding's popularity, and the wavering inclinations of women in the twentieth century, there have always existed advocates who revered this mother-infant ritual. In 1983, Janice Dike, a teacher in the Orange County, Florida, School System, sued the school board over their refusal to allow her to privately breastfeed her infant during lunch period. Winning her appeal, the court articulated their view that "Breastfeeding is the most elemental form of parental care. […] like marriage, is 'intimate to the degree of being sacred.'"[6] Sacred: of the Eucharistic elements, meaning consecrated and hallowed. During breastfeeding, the materiality of the mother's body is expressed in utility: she conveys benefits, both ethereal and physical.

In *The Sacred Balance: Rediscovering Our Place in Nature*, David Suzuki writes,

"After birth, breast-feeding continues the intimate connection between mother and baby. At the baby's cry, even at a distance, the mother's breasts 'let down' their milk. And like the love it fosters and expresses, the benefits of nursing are reciprocal."[7] This reciprocity is explained as a "psychological oneness" between mother and child, "which allows the mother to satisfy her own dependency needs (needs to be cared for and loved) at the same time meeting the baby's dependency needs."[8] The initial blessings offered by breastfeeding constitute an emotional give-and-take, but they soon give way to pleasurable biological benefits, beginning first with the mother. As an infant suckles, the nerve endings in the nipple are stimulated, eliciting the release of the hormones prolactin and oxytocin. Oxytocin contracts the alveoli in the breast, which squeezes milk into the ducts, preparing it for breastfeeding. When an infant suckles after delivery, the oxytocin causes a contraction of the uterus, which expels the placenta and helps stop postpartum bleeding.[9] Known as the "hormone of love," however, oxytocin is also associated with orgasm, birth, and bonding, while prolactin, "the mothering hormone," is touted for its ability to "have a relaxing effect on the mother and enhance the desire for mother-infant proximity."[10] Thus, hormones evoked during breastfeeding convey physiological benefits for the mother in addition to benefits for her postnatal body. Breastfeeding initiates mother-child bonding, as well as a literal and figurative healing of the self. But as breast milk is transferred to the child, it possesses significantly more profound benefits, as the virtues of this sacramental gift enhance.

Confirmation

The values of human breast milk for infants have been widely explored, contributing to the maxim by lactation supporters that "breast is best." La Leche League, an international breastfeeding advocacy group founded in 1956, educates new mothers regarding the importance of their particular milk as a food source for their infants: "Your milk is uniquely suited to meet your baby's nutritional needs. No two mothers produce identical milk."[11] The composition of a mother's milk offers crucial elements that contribute to the sustained health of her child; a cow's milk, not surprisingly, is formulated with the nutritional needs to suit her calf, not our children. To begin with, human milk contains levels of casein and wheat proteins that are markedly suited for human children. The casein protein is found at higher quantities in cow's milk, which becomes difficult for the infant to digest as it forms into large curds in the stomach.[12] Zinc in human milk is more easily absorbed than zinc in cow's milk, and crucial levels of fluoride passed from mother's milk appear to be the safe quantity for infants to absorb. Infant formula, which is primarily made of cow's milk, may interrupt healthy organ functions. The structures of bovine insulin and human insulin are similar, so that "the infant's immune system begins to manufacture antibodies in response to the foreign insulin protein in formula. Later on—sometimes many years after the fact—these antibodies begin to attack the pancreatic cells that make human insulin."[13] Human breast milk also safeguards the body against allergies. Taurine, an amino acid found in human breast milk but not cow's milk, plays an important biologic role in the development in brain tissue and the retina of the eye.[14] Such benefits promote healthy digestion, mineral absorption, and unimpaired development, as the evidence suggests that infant formula is

inferior in its structure and potency. Still, the advantages of human milk achieve even much more impressive feats.

Breast milk is alive. Slow, early development of the immune system is unique to primate infants, and emerging around 200 million years ago, lactation evolved "as a means of transferring the protective functions of fully mature immune systems across generations; all mammals derive essential protections from their mother's milk."[15] Writing of her own experiences breastfeeding, Sandra Steingraber proclaims, "Every time I breastfeed Faith, antibodies and living cells from my blood are sent coursing through her blood, physically enacting the hopes of every mother for her child—that I can keep you from harm, that you can learn from my past sufferings."[16] During the development of a baby's nervous and endocrine system during the first years of life, its immune system becomes better equipped to protect against germs. While suckling, as milk passes through the breast's unsterile duct system, microorganisms are amassed by the nipple, allowing the infant to build a steady immunity against potentially harmful environmental organisms.[17] A mother's breast and the milk she produces work in partnership to deliver valuable sources of protection and care. Anti-inflammatory and immunoregulatory agents in breast milk contribute to a decreased risk of inflammatory disorders such as "asthma, dermatitis, rheumatoid arthritis, diabetes, cardiovascular disease, and certain cancers, as well as obesity."[18] Breastfed children also demonstrate lower incidence of acute ear infections, urinary tract infections, and meningitis.[19] In a prescription medication culture, breast milk, free and free-flowing, appears to be the ideal preventative measure.

Breast milk also heals the sick: it is a miracle liquid, the waters of the Pool of

Bethesda; the ability of human milk to battle infections is such that one in five childhood deaths could be prevented if all infants were exclusively fed breast milk for the first six months of life.[20] In 2011, an analysis of 288 studies concluded that breastfeeding is protective against SIDS (Sudden Infant Death Syndrome). Infants who breastfed for at least two months were 60% less likely to die of SIDS, and there was a 73% reduction in death for those who exclusively breastfed for any duration.[21] As many causes of SIDS have thus far eluded mothers and medical professionals alike, perhaps potential prevention might offer some solace.

In panning human milk for its value, we have happened upon colostrum: liquid gold. Beginning mid-pregnancy, a woman's breasts produce colostrum, a thick yellow fluid akin to a superfood for developing infants, as it comprises all of the nutrients of mature milk in a concentrated form. Out of the first environment flows an elixir that is an infant's first food; the name colostrum is Latin but of unknown origin, as though the designation itself is as esoteric as all the potent ways in which the liquid heals. There are rich levels of immunoglobin (antibodies) and lactoferrin (a component of the immune system) found at much higher concentrations in colostrum than in mature milk.[22] All of these compounds have anti-infective effects, which protect the infant during development and well into childhood. This liquid gold also functions as an infant multivitamin, conveying Vitamins A, B12, D, and E to the suckling child.[23]

In 2011, the Surgeon General of the United States, Regina Benjamin, released "The Surgeon General's Call To Action to Support Breastfeeding." In the report, she explains,

> I have issued this *Call to Action* because the time has come to set forth the important roles and responsibilities of clinicians,

> employers, communities, researchers, and government leaders and to urge us all to take on a commitment to enable mothers to meet their personal goals for breastfeeding.[24]

It seems breastfeeding is more than choice: it is an issue of public health. Yet, while groups like La Leche League make bold claims such as "Breastfeeding is every baby's birthright,"[25] research into modern-day components of human milk accrues. The inestimable gifts offered through the passage of milk from mother to infant are pronounced, and one cannot help but believe that health and soundness is a legacy—an endowment—to which all children are entitled.

Anointing of the Sick

The Trojan Horse was a gift offered in deception and welcomed by carelessness, leading to a dismantling of a city from inside its own walls. In the tenth year of the Trojan War, the goddess Athena—patroness of Athens—helped Odysseus devise a plan to cripple the city of Troy. Odysseus constructed a hollow wooden horse large enough to conceal thirty Greek warriors. Complete with inscriptions along its side, the Horse was disguised as a sacred gift, an offering to Athena in atonement for the theft of Palladium. The wooden structure towered high above the Scaean gate of Troy, so that the Trojans' acceptance of the offer would require a dismantling of part of the gate to bring the Horse into the city. The Greeks were elaborate in their scheme, burning their camps and pretending to leave the war behind. Cassandra, cursed by the gift of prophecy that no one believed, warned her people of the dangers of the Greek statue, but nobody listened. The Trojan priest Laocoon also prophesied of men inside the horse, but before he could spear the wooden structure, snakes came up out of the ocean and pulled the priest and his son

into the sea, drowning them both. The Trojans did not heed the bad omens, and instead razed their gate and brought the Horse into the city, celebrating their victory into the night. Once they had gone to sleep, Odysseus opened the trap door and unleashed Greek warriors into the streets of Troy. They set fire to homes, fires that served as signals for the rest of the Greeks lying in wait outside of the city. They ran through the open gate and continued the slaughter. The trespass of its walls, the dismembering of the anatomy of the city; Troy became most vulnerable when its interior was annexed.

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In 1951, a trespass was exposed when the first discovery of breast milk contamination was reported in Washington DC. The milk of thirty-two non-occupationally exposed African American women was tested for insecticides; thirty of the women surveyed had detectable levels of DDT—a popular agricultural insecticide originally used for the control of malaria and typhus—in their breast milk.[26] Industry's offering had arrived at the gate. Though equipped with this knowledge, the USDA and FDA "failed to respond effectively through regulation for nearly a quarter-century, exposing tens of millions of additional people in the United States to these residues."[27] Residues, they supposed, are negligible.

Today, over sixty years after this initial discovery, the milk of human mothers is a liquid archive of synthetic contaminants. It is a libation complicated by a list of ingredients intimately familiar: gasoline vapours, dyes, wood preservatives, dry-cleaning fluids, paint thinners, toilet deodorizers, rocket fuel, termite poisons, television casing, cosmetic additives, cable-insulating materials, and pesticides. Mercury, lead, and arsenic: "Just knowing the number of chemical contaminants in breast milk is a humbling lesson

in acknowledging the dangerous permeability of human bodies."[28] Detectable foreign compounds are also uniquely unintelligible: Trichloroethylene, perchlorate, dibenzofurans, dioxins, and glyphosate.[29] PVC, DDT, PBDEs, PCBs, BPA: runes of industry migrate through fat and ducts, while the fine print of a mother's breasts complicates the details regarding the virtuous effects of her milk. Portraits of chemical lives are infused into our breast milk at higher concentrations than in our own food, so that the dietary dose of contaminants consumed by babies is much higher than the doses we consume ourselves.

Breastfeeding advocates have made progress since the middle of the twentieth century, as the shared experience of breastfeeding continues to be framed in a light of authenticity and innocence. In their breastfeeding resource guide, La Leche League writes:

> Without thought or conscious effort on your part, your milk will come. You can look beyond to the many days together as a nursing couple. The security and warmth of your arms, the ready comfort of your milk, the familiar smell and pulse of your body are all precious food to fill your baby's body and quicken his mind and spirit. Such accomplishments take time. But is there a more awe-inspiring task? This is the ageless beauty of mother and child—a time of grace and peace.[30]

Breastfeeding is an act of wonderment and quiet reflection. In my home country of Canada, a 2009 survey reported that 87% of mothers breastfed or tried to breastfeed their last child.[31] In the United States, a survey conducted in the same year indicated a breastfeeding initiation rate of 77%; continued breastfeeding at twelve months increased from 23% to 25%.[32] Breastfeeding rates continue on a steady incline, supported by agencies such as the World Health Organization, who maintain that colostrum is "the perfect food for the newborn," and recommend exclusive breastfeeding for up to six

months of age, with continued breastfeeding combined with supplementary foods for up to two years.[33] Nonetheless, amidst the championing of breastfeeding, the value of mother's milk as a human food source—if placed in another context—may be a source of debate. It is a matter of circumstance concerning one singular startling fact: *if regulated, breast milk would violate FDA standards for levels of particular synthetic chemicals in food.*[34]

Breast is best, but "purity" is no longer a part of the lexicon of maternal milk. Many have written that milk should come with a list of ingredients: I suggest it also come with a caveat. Whether or not the good in milk outweighs the bad is not the singular issue. Mother's milk is no longer one thing, but vacillates between two spheres; it is split into binaries, it is a risk-benefit analysis. Breastfeeding is still recommended, but breast milk is enveloped in qualifiers: it is a *however*, an *even though*, a *despite*: breastfeed your child, *despite* foreign contaminants; *even though* human milk contains synthetic chemicals, breast is best. Just as the light that passes through the impure is god's love, breastfeeding is—and remains—an act of love; but milk's movement through the body, through fat, through industrial landscapes of modernity, has tainted the love once-divine. The concession of foreign contaminants in human breast milk is not an outright denunciation of its physiological benefits, but it is an indictment of its polluted nature as a liquid and an instrument of sacrament.

Our mothers are contaminated, and their milk is unclean. Yet this accusation alone is not a hyperbolic charge anchored in a shallow perception of the purity of women. In *Viral Mothers: Breastfeeding in the Age of HIV/AIDS*, Bernice Hausman criticizes a "religious sensibility that mothers are really madonnas and it is up to society to ensure

their purity. Thus, what seems like an argument for ecological well-being ends up articulating an ideologically confining vision of motherhood."[35] To confuse a restrictive ideology regarding the purity of women with a very tangible corruption of bodies is careless and overly-simplified. Of course women and mothers are elastic, are multifaceted, are maternal and sexual and virtuous and corrupt. Yet an "un-confining" vision of motherhood that easily accepts mothers as already *and always* impure ultimately ignores the implications of industrial waste that pollutes our constitution, pollutes a child's first environment. It also as reinforces the government and chemical industry's method of determining safe and negligible levels of contaminants for a woman's body. If we are already corrupted, what's the harm? Furthermore, for me *personally*, for my own desire to mend a fractured spirituality, the disclosure of potentially toxic compounds in breast milk acknowledges that the confluence of bodies and contaminated landscapes perverts once-pious rituals. It is not only the body that is polluted: the tradition is polluted as well. My eighth sacrament is soiled. The toxins in our milk are agents for this aberration of this sacred practice, as we perform communion with sacramental bread that has fallen on the floor. We consume the bread because it is cherished, but the ritual is now simultaneously consecrated and dirty.

If breastfeeding is sacred, then toxins in breast milk surely complicate the hallowed communion between mother and child. Physical contamination leads to ideological repercussions. While this is admittedly partly my own nostalgia for a better, "purer" past, it is not explicitly a look backward. Rather, this is recognition of a defilement precipitated by voracious industries outside of our control. My distress is

rooted in a call for a recovery of physical self-awareness and a reclamation of a female autonomy.

Notes

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[2] Ibid.

[3] Ibid.

[4] Sandra Steingraber, *Having Faith: An Ecologist's Journey to Motherhood* (New York: Berkley, 2001) 201.

[5] "An International Comparison Study into the Implementation of the WHO Code and Other Breastfeeding Initiatives," Department of Heath and Ageing, 2 May 2012, 3 Jan. 2013.

[6] Dike v. The School Board of Orange County, Florida, and Linton Deck, Individually and as Superintendent of Schools of Orange County, Florida, 1981.

[7] David Suzuki, *The Sacred Balance: Rediscovering Our Place in Nature* (Vancouver: Greystone, 2007) 232.

[8] Lucy Waletsky, as quoted in *La Leche League: The Womanly Art of Breastfeeding* (New York: Plume, 2004) 13.

[9] Allan Astrup Jensen and Stuart A. Slorach, *Chemical Contaminants in Human Milk* (Boston: CRC, 1991) 4.

[10] Patricia Stuart-Macadam and Katherine A. Dettwyler, *Breastfeeding: Biocultural Perspectives* (New York: Aldine De Gruyter, 1995) 8.

[11] La Leche League: The Womanly Art of Breastfeeding (New York: Plume, 2004) 341.

[12] Ibid., 342.

[13] Steingraber, 227.

[14] *La Leche League*, 343.

[15] Nathaniel M. Mead, "Contaminants in Milk: Weighing the Risks Against the Benefits of Breastfeeding," *Environmental Health Perspectives* 2008: 429.

[16] Steingraber, 234.

[17] Naomi Baumslag and Dia Michels, *Milk, Honey, and Madness: The Culture of Politics and Breastfeeding* (Westport: Bergin and Garvey, 1995) 72.

[18] Mead, 429.

[19] Federico Lara-Villoslada, et al., "Beneficial effects of probiotic bacteria isolated from breast milk," *British Journal of Nutrition* 2007: 96.

[20] Florence Williams, *Breasts: A Natural and Unnatural History* (New York: W. W. Norton & Company, 2012) 186.

[21] Fern R. Hauck, et al., "Breastfeeding and Reduced Risk of Sudden Infant Death Syndrome: A Meta-analysis," *Pediatrics* 2011: 6.

[22] Jensen, 6.

[23] Baumslag, 74.

[24] United States Department of Health and Human Services, *The Surgeon General's Call to Action to Support Breastfeeding*, US Public Health Service 2011: v.

[25] *La Leche League*, 340.

[26] Ruth M. Heifetz and Sharon S. Taylor, "Mother's Milk or Mother's Poison? Pesticides in Breast Milk," *Journal of Pesticide Reform* 1989.

[27] John Wargo, *Our Children's Toxic Legacy: How Science and Law Fail to Protect Us From Pesticides* (New Haven: Yale University, 1997) 290.

[28] Bernice L. Hausman, *Viral Mothers: Breastfeeding in the Age of HIV/AIDS* (Ann Arbor: University of Michigan, 2011) 121.

[29] Williams, 99, 197.

[30] *La Leche League*, 5.

[31] Health Canada, *Breastfeeding Initiation in Canada: Key Statistics and Graphics (2009-2010)*, Health Canada 27 Jun. 2012. 1 Feb. 2013.

[32] Centers For Disease Control and Prevention, *Breastfeeding Report Card—United States, 2012*, CDC 22 Jan. 2013, 1 Feb. 2013.

[33] World Health Organization, *Breastfeeding*, WHO 2013, 4 Mar. 2013.

[34] Ted Schettler, Gina Solomon, Maria Valenti, and Annette Huddle, *Generations at Risk: Reproductive Health and the Environment* (Boston: MIT Press, 2000) 205.

[35] Hausman, 118.

III

VESSELS

As I see my soul reflected in Nature,
As I see through a mist, One with inexpressible completeness,
sanity, beauty,
See the bent head and arms folded over the breast, the Female I see.
~Walt Whitman, “I Sing the Body Electric”

Breasts create an ideal setting for contaminants. They are refuges of chemicals, platforms for the transference of environmental pollutants: it is an indictment of our form. To understand the significance of my body as a vessel of contamination, I am first examining my own design. Frank Lloyd Wright said "The mother art is architecture. Without an architecture of our own we have no soul of our own civilization."[1] I am searching for an understanding of my fabric, a personal architecture, an architecture that endures. It is a confluence of structure, function, and beauty,[iv] a holistic perspective of exterior accounts and interior expressions. This architecture of sisterhood is one that I share. It is our female vernacular.

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The structure of the mammary network is more intricate and personal than I estimated. A cross-section of my own breasts reflects back upon me from the pages of a science book. My interior ductwork looks less like a cavern of fat and more like a series of lateral Umbrella Thorn Acacia trees mounted upon those seaweed bulbs I found gathered along California beaches during my road trip down the Pacific Coast Highway.

The network of ducts and nipples and muscle expresses itself in womanhood, but the components of the breast are present by the sixth month of fetal life, and during puberty, ovarian estrogen compels a girl's ducts to multiply and grow.[2] The capacity to breastfeed exists, even if the act itself is never realized.

The milk-production process is efficient. Breasts are made up of glandular duct systems that are surrounded by fatty tissue (see Figure 2), and every woman has the

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[iv] Ancient Roman Architect Vitruvius wrote that a building must be considered "with due reference to function, structure, and beauty" (*Utilitas*, *Firmitas*, and *Venustas* in his original Latin).

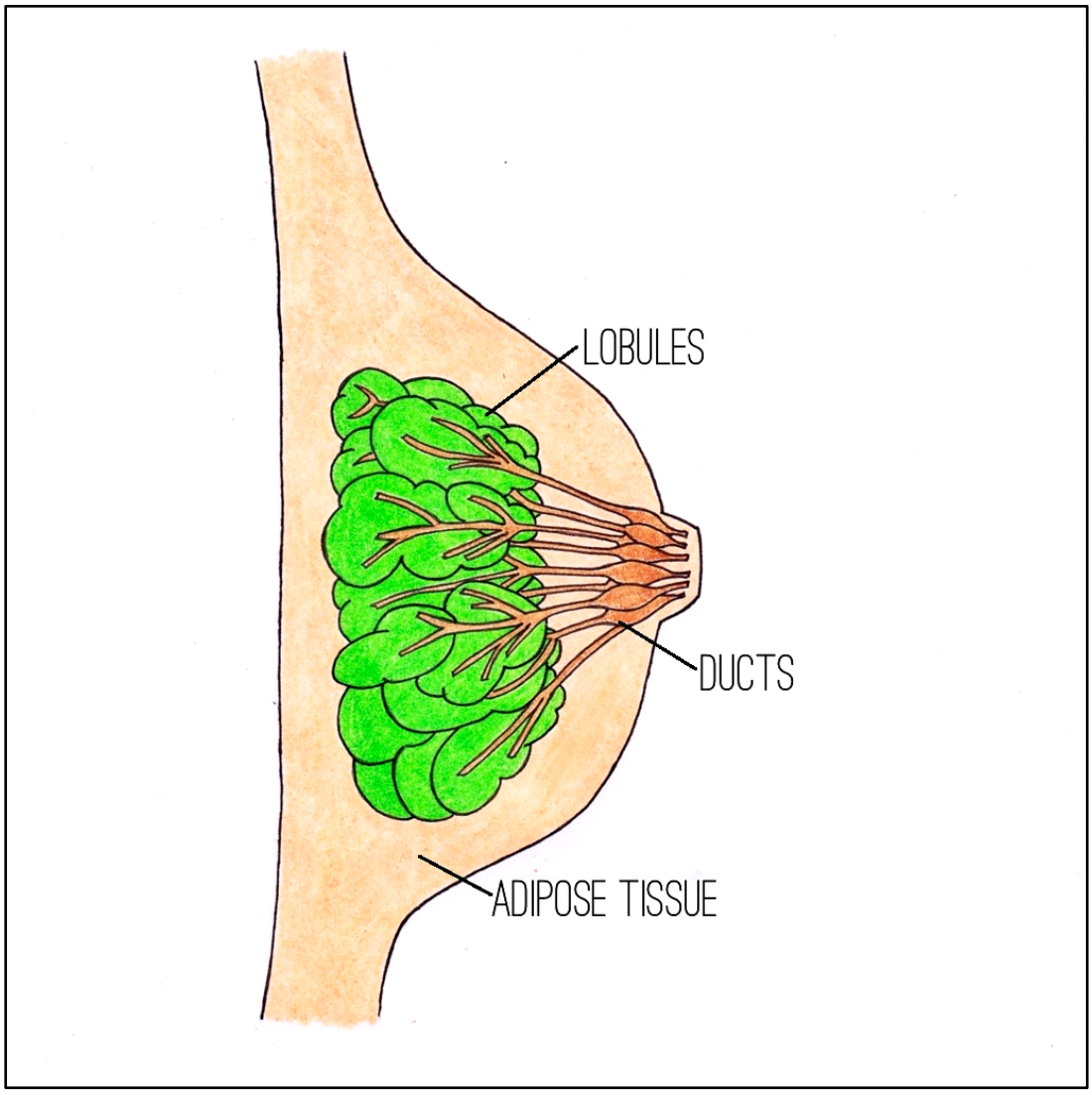

Figure 2: A side view of the breast shows its tree-like duct and lobule system, as well as the nipple's multiple outlets for milk flow (Adapted from Yale School of Medicine).

same amount of glandular tissue, regardless of her breast size; function and aesthetics are independent. The leaves of the "trees" in my breasts are called alveoli, and they are tiny cells that produce milk when stimulated by the hormone prolactin. Extracting from the blood, alveoli function as little sponges, absorbing water, salts, sugar, fats, and tiny nitrogen-containing molecules to create milk in milk sacs. Each breast contains between 2,000 and 16,000 milk sacs, and the milk-delivery network to the nipple passes though an elaborate system of connecting tubes that join to become ducts—the seaweed bulbs in the recesses of my chest.[3] There are multiple ducts that emerge, and "you are forgiven if you think the human nipple is like a faucet or a garden hose […] the human nipple is more like the head of a sprinkling can, with ten to fifteen ducts emerging at various points on and around it."[4] Breasts as sprinkling cans, irrigators of the earth. They offer an endless supply of milk: as long as the infant continues to ask, the breast will continue to produce. During her childbearing years, milk is a woman's renewable resource.

The fabric of the breast is present early on in fetal growth, while the ability to breastfeed is realized during sexual development. Our familiar dialogue around breasts spans a spectrum from representations of sensuality to representations of motherhood. It is uncomfortable, I believe, to protract that spectrum, and to include in our dialogue breasts as cisterns of pollution.

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Our breasts are repositories of our chemical transgressions. My breasts, yours, your sister's, your daughter's, are the foci of our contaminated landscape. The tragedy is a biological one: the interior of the human breast is made up of adipose (fat) tissue, and the blood flow to the breast is high compared to blood directed towards other tissues, so

contaminants that are fat-soluble accumulate in breasts.[5] Intact organic solvents can also reach the breast and accumulate there, because breasts do not contain the necessary enzymes to detoxify these foreign contaminants.[6] Our breasts are ocean gyres of pollution. The architecture of our breasts seduces synthetic chemicals.

Biomagnification is a critical piece in the story of the contamination of milk, and explains how breasts have become repositories for toxins. John Veranth is a Research Associate Professor in Pharmacology and Toxicology at the University of Utah. I spoke with him to conduct an interview for a short film I made about breast milk, and we met in his colleague's office in the Kennecott Building on campus.[v] I was curious about the types of synthetic chemicals prevalent in our bodies. Vernath qualified my question by explaining the ways in which particular chemicals accumulate in the human body. "Those generally are compounds that are fat soluble or soluble in oil. This is often the way it is tested in the lab," he explained. "They'll measure whether [the compound] partitions between a water and oil phase in an analytical test, and that's usually pretty predictive of how it behaves in the environment." Compounds that are difficult to decay tend to linger, and ones that are fat soluble will accumulate in foods. During this process, organic compounds that do not degrade easily will not get metabolized but will accumulate in the fatty tissues of animals, and rather than being excreted, the compound will endure. The consumption of organisms lower on the food chain by others higher on the food chain

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[v] The building is named so because of generous support from the Kennecott Utah Copper Corporation, a mining company owned by Rio Tinto that runs an open-pit copper mine in Bingham Canyon, on the west side of the Salt Lake Valley. Mining practices expose heavy metals such as arsenic, cobalt, copper, cadmium, lead, and zinc, and are leached out and carried downstream as water washes over the rock's surface. In 2011, Forbes named Salt Lake City the ninth most toxic city in America, based on air and water quality, citing Kennecott as a contributor to the city's pollution.

(which will, in turn, get consumed by humans) leads to greater and greater accumulation of a pollutant, "magnifying" it. Biomagnification is like a snowball rolling its way through food chains, contaminants latching to its multiplying walls.

When Rachel Carson described the behaviour of DDT in her book *Silent Spring*, biomagnification of the pesticide was one of her central concerns:

> One of the most sinister features of DDT and related chemicals is the way they are passed from one organism to another through all the links of the food chains […] The DDT will turn up in the milk in the amount of about 3 parts per million, but in butter made from this milk the concentration may run 65 parts per million. Through a process of transfer, what started out as a very small amount of DDT may end as a heavy concentration.[7]

As a result, organisms at the top of the food chain generally suffer greater harm from a toxin or pollutant than those at lower levels. Chemicals accumulate. Consequently, "as the rarer members of the higher links dine upon the commoners below them, poisons dispersed among the many are drawn up into the bodies of the few."[8] Infants who dine upon their mothers are most at risk.

It is alluring to speak of our mothers as perfect, pure, and blameless. The reality is sobering: the structure and maternal function of our breasts promotes not only the storage of potential toxicants, but their transference to infants. Contaminants not resting in our breasts lie in wait elsewhere in a woman's body, like the fat in her stomach, hips, and thighs. Persistent organic pollutants are lipophilic (fat soluble), so they collect in our body fat. To prepare for breastfeeding, "a woman's body mobilizes lifetime fat stores and therefore transmits a portion of her stores of environmental contaminants to her newborn during breastfeeding."[9] Of the fat solicited during lactation, 60% is compiled from a woman's body fat reserves, while only 30% is taken from her diet.[10] Weight reduction

during pregnancy or lactation actually mobilizes fat tissue, which results in elevated levels of milk contamination. Furthermore, contaminants difficult to break down build up in the body, so a mother's age is often analogous to her body burden of foreign toxins.[11] As the average age of first-time mothers has increased in the last several decades, POPs have had prolonged opportunities to amass in the body.

We absorb poisons physically and chemically, but the realization of our own contamination results in a toxic *emotional* ingestion of the compounds we encounter. We retain toxicity we can't even see. Seeing is believing, but we are forced to reluctantly trust in the virulence of our body. Beginning with poetry and perception, advancing towards taxonomic designation and interior ductwork, the biography of my breasts is complex. These explorations continue to magnify my own understanding of my body as a landscape un-immune to corruption. And despite my desire to evade possible intruders, my efforts are futile.

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We are Troy. The Trojan Horse is not just the divine sacrament we give to our infants, but is the benefits of modern convenience that we accept willingly into our homes, and carelessly into our bodies: beware of industry bearing gifts. We are the Trojan women, our breasts the Scaean gate. But rather than a physical dismantling of ourselves, when we allow entrance of these offerings, we dismantle our principles, our rituals, our sovereignty, our legacy. Before inviting them into the city, we should first ask who they are.

Notes

[1] "The mother art is architecture. Without an architecture of our own we have no soul of our own civilization." *World of Quotes: Architecture Quotes*. 2013, 27 Jun. 2013.

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[3] Baumslag, 72.

[4] Steingraber, 204.

[5] Wargo, 169.

[6] France P. Labreche and Mark S. Goldberg, "Exposure to Organic Solvents and Breast Cancer," *American Journal of Industrial Medicine* 1997: 11.

[7] Rachel Carson, *Silent Spring* (New York: Mariner, 1962) 23.

[8] Steingraber, 250.

[9] Mead, 430.

[10] Steingraber, 262.

[11] M. Schlaud, et al., "Organochlorine Residues in Human Breast Milk: Analysis Through a Sentinel Practice Network," *Epidemiology and Community Health* 1995: 20.

IV

VENOM

If we are going to live so intimately with these chemicals—
eating and drinking them, taking them into the very marrow of our bones—
we had better know something about their nature and their power.
~Rachel Carson, *Silent Spring*

Contaminants find entryways. They exploit the latticework of the skin, the boundaries that separate outside from in. By nature, we are all accessible. Our impenetrability is both beautiful and ruinous.

On October 23rd, 1983, when I was three months old, a Mercedes-Benz truck filled with explosives drove into the Beirut International Airport where the American Marines had set up their local headquarters. The driver crashed through a barbed-wire fence, pushed through a gate, and ploughed into the building housing the Marines. The troops had been expecting a water truck. The driver successfully penetrated the barrier of the headquarters with violence and relative ease. The suicide bomber detonated the explosives, which collapsed the four-story structure and killed 241 American servicemen. The incident was the deadliest single attack on Americans overseas since the Second World War.[1] The barracks were destroyed from the inside out.

Assaults are waged upon the terrain of our bodies. Potential toxins pervade our fabric, but in this chemical war, our adversaries are diverse. Chemical contaminants are not identical, are not "one size fits all." Some are compounds from the past, ones that persist and linger and refuse die. Some are from the present, chemicals deemed essential, contaminants that *will* endure. And then there are some that would disappear tomorrow, but for the fact that they are so deeply entrenched in our daily lives.

<u>My mother is part industrial coolant: PCBs</u>

Polychlorinated Biphenyl Ethers are a resilient compound: they represent the endurance of a reckless chemical past, placing our bodies firmly in yesterday's memory. In the 1920s, the Southern Manganese Company moved its business to Anniston,

Alabama, where it established a manufacturing plant to make artillery shells. Changing its name to Swann Chemical in 1925, it would be only four years before the company began the production of Polychlorinated Biphenyl Ethers, or PCBs, as they are commonly known.[2] In 1935, the Swann Chemical Company was acquired by the Monsanto Chemical Company. Monsanto continued the manufacture of PCBs, and the compound became a profitable success for chemical engineers who would eventually synthesize thousands of atomic medleys. The initial advantages of PCBs were numerous, as they were nonflammable, extremely stable, and did not, at first, exhibit any hazardous dangers.[3]

At the time, new building codes required coolants in transformers and capacitors used inside buildings,[4] so PCBs quickly found an application in the electric industry. They were also used as lubricants, cutting oils, hydraulic fluids, and liquid seals. Between 1957 and 1971, paper companies used PCBs in their carbonless copy paper.[5] PCBs were also ingredients in pesticides, inks, and paints, and made wood and plastics non-flammable. They also preserved rubber and stucco.[6] The broad uses of PCBs meant that, via numerous consumer products, they quickly and easily found paths into lives and homes.

In 1964, Danish-born chemist Sören Jensen, while testing human blood for DDT, continued to encounter a mysterious substance everywhere he looked: in wildlife specimens, in waterways, and in the hair samples collected from his wife and infant daughter. Publishing his work in the *New Scientist*, Jensen realized that the mysterious compound had accumulated in the environment, even though it had never been produced in Sweden.[7] Once he uncovered the identity of the substance, Jensen's findings

concluded that PCBs "accumulate in certain organs of an animals and the food chain. They are said to be related to DDT and are equally poisonous."[8] Although there had been indicators of PCBs' hazardous effects in 1938, Jensen's find was the first instance in which PBCs were identified as a pervasive pollutant.[9] Used as preservatives, PCBs also persevered. The storied past of the compound since Jensen's claims have yielded frightening details regarding the more serious effects of PCB exposure. Acting as an immune suppressant, the EPA has confirmed that PCBs are a risk factor for non-Hodgkin's lymphoma. Additionally, "suppression of the immune system is a possible mechanism for PCB-induced cancer," which includes rare liver cancers and malignant melanoma.[10] Their toxic effects, as well as their ability to accumulate in the food chain, precipitated their ban in the United States in 1979, and other industrial nations followed suit. The Environmental Protection Agency's ban of the compound explained: "the EPA rules will gradually end many industrial uses of PCBs over the next five years, but will allow their continued use in existing enclosed electrical equipment under carefully controlled conditions."[11] Thus, while the ban ended all manufacture of PCBs, the compound itself continued to persist in its past applications.

In its forty years of production, an estimated 3.4 billion pounds of PCBs were manufactured globally.[12] At the time of the ban in 1979, the EPA estimated that 150 million pounds of PCBs were diffused throughout the environment, which included water and air supplies; they estimated that an additional 290 million pounds of PCBs could be found in American landfills.[13] Controlled applications were insufficient in preventing the dispersal of the compound. According to the Agency for Toxic Substances and Disease Registry, "PCBs can be found in almost all outdoor air, in indoor air, on soil surfaces, in

surface water, and on land plants"[14]; the pervasiveness of the chemical is observable more than thirty years after the termination of its production.

The tight chemical bonds of PCB molecules make them resistant to metabolic breakdown. All of the PCBs ever manufactured have either gone to a chemical waste incinerator, or are still in the environment.[15] For tangible objects and detectable loads, incineration is an option. However, combustion of chemicals produces dioxins, which are described by the UN as "one of the most toxic compounds known to humans, whose harmful effects, even in extremely minute concentrations, include induction of cancer and birth defects. It has become a widespread pollutant because of the use of certain dioxin-containing herbicides."[16] Incineration is not a viable solution for compounds already in our homes and bodies, and those in our breast milk. There appears to be no easy way to eradicate PCBs once they have been produced.

Consider a composite of PCB's molecular structure: two joined chlorine atoms on benzene rings, which Carl Cranor describes as a pair of glasses with hexagonal rims viewed from the front.[17] Two perfectly symmetrical silhouettes; to me, they are distorted, rigid breasts. Sharp and static lines. Industrial breasts.

The widespread and varied uses of PCBs, as well as their resistance to natural processes of decay, explain the compound's pervasiveness, as they can still be detected in the blood and breast milk of the U.S. population.[18] In fact, PCBs make up the majority of toxic residues found in human tissue,[19] even in women who were born years after the ban took effect: This is me. It is my younger sister in Canada, my American students, my Italian cousins. PCBs carried in water accumulate and endure in the body fat of fish, birds of prey, carnivorous sea mammals, and beef and dairy cattle. Because of

biomagnification, organic compounds that resist degradation will accumulate in the fatty tissues of animals, and rather than being excreted, the compound will persist. As PCBs are magnified in organisms, they actually become more of a threat: "PCBs tend to be more toxic as they ascend the food chain […] bioaccumulated PCBs are more toxic than commercial PCBs. Consequently, PCBs in animals higher up the food chain are both concentrated and more toxic."[20] Per kilogram of body weight, *breastfed children living in industrialized countries consume fifty times more PCBs per pound of body weight than do their parents on a daily basis.* Breastfed infants are also "predicted to have cumulative PCB exposures that are up to 18% higher than […] formula-fed infants."[21] At the apex of the food web, human infants might be suckling their way to affliction.

In the 1950s, biologists noticed a disappearing mink population from the shores of the Great Lakes. Their research found that minks are highly sensitive to PCBs, which were contaminating the ecosystem through industries found along the shores of the Great Lakes. Mink, they discovered, "failed to reproduce when they were fed food containing from .3 to 5 parts per million of PCBs"—quantities observed in today's Great Lakes, and in the fat of human breast milk.[22] This is not to say that disorders expressly affect mink and humans equally. Rather, the account of Great Lakes mink shows perhaps that ostensibly trivial levels of synthetic chemicals have the ability to precipitate biological abnormalities. What disturbs me is my own proximity to the story: I grew up in the suburbs of Toronto. Lake Ontario was *my* body of water, and yet it served as a basin of contamination. Poison is channeled through waterways, as waterways are the ductworks of the world.

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Qikiqtarjuaq ("kick-eek-tar-jua"), Nunavut, is an Inuit island community surrounded by the frigid waters of Baffin Bay in the far north of Canada. The town is situated 2800 kilometers north of where I was born and raised. Here, infants breastfeed on toxic contaminants belonging to industries located thousands of miles away. Canadian health studies have shown that, apart from people contaminated in industrial accidents, *the inhabitants of Qikiqtarjuaq have the highest levels of PCBs found in any human population.*[23] Inuit levels of some persistent organic pollutants are five to eight times higher than in the bodies of people living in Canada's largest cities.[24] Despite very little industry in the secluded Arctic, high concentrations of pollutants indicate that contaminants make the North their final resting place. Arriving by wind and water currents, persistent organic pollutants are carried to the northern latitudes by the jet stream, while the cold temperatures compel toxic particles to condense and fall.[25] Most of the dioxin found in Nunavut does not originate in Canada, but in industries located in the United States.[26] Foreign hazards of foreign industries in foreign countries.

The fundamental problem is that ocean food chains are longer than terrestrial ones, so the Inuit, whose high-fat diets consist of marine carnivores, carry with them higher concentrations of chemicals than many people who directly benefit from the industries that discard these contaminants. A pollutant released in North America or Europe will find its way into the ocean and get concentrated, ascending the food chain from lower level aquatic animals to larger ones, and ultimately to the fish and marine mammals that the Inuit are eating.[27] Much of the Inuit diet consists of Ringed seals, bearded seals, walruses, and Beluga whales, which can be dangerous when considering

how these animals are lipid-rich and have long life spans. But the top of the Arctic food chain is not occupied by the Inuit hunter; rather, his nursing infant subsists at one trophic level above the rest.

A study conducted between 1985 and 1987 measured PCB levels in blood samples of residents of Qikiqtarjuaq, and results indicated that "PCBs in blood exceeded the tolerable levels set by Health Canada in the majority of residents under 15 years of age and in nearly two out of every five women of child-bearing age."[28] Mothers in Nunavut have breast milk containing twice the average amount of dioxin as women in Southern Quebec and mothers living in Southern Ontario, where I grew up.[29] Arctic babies consume seven times more PCBs than the typical infant in Southern Canada or the United States.[30] The indigenous people of the country of my birth, whose frozen northern roots extend much deeper into the past than my own, are the most contaminated people on earth.

My mother is a fish. In Inuit legend, Sedna was a beautiful girl who lived with her father. After refusing many suitors, her father finally decided that she should marry a well-to-do hunter. Sedna boarded the hunter's kayak and set-off for her new home, but when they arrived at a distant secluded island, she saw the hunter for whom he truly was: a raven in disguise. Sedna called out to her father in the ocean wind while she passed her days living among jagged rocks and feathers, eating fish caught by the raven. One day, her father heard her cries and came to rescue his daughter. Sedna and her father managed to escape the island, but the raven found them and began to attack their kayak. Sedna's father, thinking only of himself, pushed his daughter into the Arctic waters and told the raven to take her and spare himself. As Sedna grasped to the kayak's side, her father

struck her fingers with his paddle. Frozen by the frigid water, Sedna's fingers broke off, sunk into the ocean, and became seals. When she continued to struggle onto the boat, her father one again struck her; frozen, her arms broke off, descended into the water, and became whales. Sedna, no longer able to fight, let go of the kayak and settled to the bottom of the ocean, but she did not perish, and is still today the goddess of the sea, mother of the ocean's animals. Her companions wait with her on the ocean floor, and her fury at man's deception is what generates violent seas and Arctic storms.[31] Sedna's own body was sacrificed to become the Arctic's ocean mammals, but when consumed by the Inuit, the animals are restored into human flesh. Yet Sedna's modern-day descendents, victims of foreign greed and local geography, are polluted by enterprise. Their body is contaminated; industry is the raven.

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"Without chemicals, life itself would be impossible." So reads a Monsanto Chemical Company magazine advertisement from 1990.[32] We all have an intimate connection with Monsanto, if only because we have residues of some of their most notorious compounds stored within the fat of our bodies. From an outsider, Monsanto's history is not so much astounding because of its market success, but because of its unbelievable role in the manufacture of some of the most malevolent chemicals of the twentieth century.

In 1901, self-taught chemist Francis Queeny established Monsanto Chemical Works, naming the company after his wife, Olga Mendez Monsanto.[33] Monsanto was a profitable business, beginning with the production of saccharin, that sweet-tasting derivative of coal tar discovered in 1879, which was later sold by Monsanto to the Coca-

Cola Company. Monsanto's first acquisition was the 1918 purchase of a company that made sulfuric acid, but its first real lucrative gain was when it bought Swann Chemical in 1935.[34]

Through this acquisition, Monsanto became the only North American producer of PCBs, and "reinforced its monopoly in the international PCB market, guaranteed by a patent that enabled it to sell licenses almost everywhere in the world."[35] As early as 1938, Monsanto knew about the compound's toxic effects, when a researcher from Harvard named Cecil K. Drinker sent a report to Monsanto stating that animals exposed to PCBs developed liver lesions.[36] In response to Drinker's assessment, no action was taken. In 1966, the toxicity of PCBs was observed in Anniston, Alabama, in the west Anniston creek where the company would discharge their chemical waste. Monsanto managers discovered that "fish submerged in that creek turned belly-up within 10 seconds, spurting blood and shedding skin as if dunked into boiling water."[37] The managers decided to keep their discovery quiet. The concealment regarding the toxic effects of PCBs continued as late as 1975, when a company study found that PCBs caused tumors in rats. For the official report, Monsanto ordered the conclusion be changed from "slightly tumorigenic" to "does not appear to be carcinogenic."[38] Monsanto continued to produce PCBs until the chemical was banned in 1979.

During this time, Monsanto also became one of fifteen companies to produce the insecticide DDT, which was first used during World War II to combat malaria. When the compound found agricultural applications after the war, it became one of the most infamous contaminants in chemical history, and likely contributed to the near-demise of the bald eagle. Rachel Carson's famous battle against the indiscriminate use of DDT was

chronicled in *Silent Spring*, where she writes, "For the first time in the history of the world, every human being is now subjected to contact with dangerous chemicals, from the moment of conception until death."[39] Studies have shown that DDT exposure can increase risks of breast and pancreatic cancer, and it is a confirmed neurodevelopmental toxin.[40] Monsanto produced the pesticide between the 1930s until its ban in 1972.

In the 1960s, Monsanto landed the company's largest contract as the manufacturer of Agent Orange for the Vietnam War. Agent Orange was an herbicide used to kill trees and plants in Vietnam that blocked visibility of American troops in the air. It was later discovered that the herbicide was contaminated with dioxins, chemicals that are by-products of certain industrial processes. Emerging evidence shows that dioxin causes birth defects, hinders the immune system, and is a proven carcinogen.[41] On one particular day in 1962, 3,000 villages in Vietnam were contaminated with defoliants, 60% of which was Agent Orange—"the equivalent of 800 pounds of pure dioxin."[42] Used between 1961 and 1971, VA officials of the US military estimate that 2.6 million military personnel who served in Vietnam have been affected by exposure to Agent Orange.[43] The Vietnamese Red Cross estimates that as many as a million people now have disabilities or other health problems associated with the herbicide, approximately 100,000 of whom are disabled children.[44] In Vietnam, Agent Orange has afflicted three generations of people.

Monsanto has a branding problem, which has likely precipitated their attempt to reinvent themselves: "While we share the name and history of a company that was founded in 1901, the Monsanto of today is focused on agriculture and supporting farmers around the world in their mission to produce more while conserving more. We're an

agricultural company."[45] In fact, an internal search on their website for DDT or PCB returns no results. However, an Agent Orange search displays a reference that begins, "We have great respect for the U.S. soldiers sent to war and all those affected by the Vietnam conflict. All sides share in the pain from this difficult time in our history. One of the legacies of that war is Agent Orange, where questions remain nearly 40 years later." In fact, the toxic effects of the chemical have widely been answered, and the only questions that remain are how much Monsanto actually knew.

Today, Monsanto's contribution to the chemical world comes in the form of Roundup, the world's most widely sold herbicide,[46] and roundup-ready crops, which are designed to withstand the herbicide. The toxic effects of glyphosate, the main component of Roundup, are inconclusive. Regardless, a "former" chemical titan now entwined in agriculture has attempted to distance itself in many ways from its past, insinuating that it shares a name, but not a history, with the Monsanto of last century. Yet, the chemical effects of its products still haunt us today: from a disabled Vietnamese child to an affected war veteran, from modified seeds to residues in the breast milk of women born long after their chemicals were banned. Monsanto will have to work a lot harder to distance itself from its toxic pedigree. If the company's history teaches us something, it may be that we cannot always depend upon the altruism of chemical manufacturers to put public health before quarterly profit.

<u>My mother is part flame retardant: PBDEs</u>

At the beginning of the Second World War, the natural rubber supply from Southeast Asia was cut off. Looking for alternatives, German chemist Otto Bayer

invented polyurethane, a rigid polymer that would step in to replace rubber. It was used to coat warplanes and line Nazi boots, and by 1954, the material was filled with air bubbles to create a flexible foam that was inexpensive and pliable. Its versatility meant applications in everything from insulation to upholstered furniture.[47] The rub? Polyurethane is highly flammable, "earning nicknames like liquid gas and fatal foam. A typical home filled with polyurethane products can literally burst into flames in five minutes once the petrochemical gasses heat up enough."[48] A solution came in the form of chemical flame retardants, as polybrominated diphenyl ethers (PBDEs) were introduced in the 1960s to slow the spread of fire and delay combustion.

PBDEs have widespread uses, whether added to plastics used in electronics or coated on flammable elements. PBDEs are ubiquitous, employed in products such as building materials, foam, pillows, sofas, carpets, drapes, computers, and mattresses. They are often applied to automobile upholstery, as well as the plastic used to make the back part of television sets (yes, your TV has found another way to kill you).[49] While structurally similar to PCBs, PBDEs function differently in that they are not chemically bonded with plastics or textiles, but are instead added or blended to the goods they safeguard. Consequently, during deterioration of the product, PBDEs can separate or leach from the materials they protect and escape into the environment. Estimates suggest that approximately 148 million pounds of PBDEs are manufactured annually worldwide, 40% of which is distributed to North America.[50] As Florence Williams succinctly put it, we live in a flame retardant nation.

Flame retardants in food were recently thrust into the headlines when a fifteen-year-old began an online petition for the removal of brominated vegetable oil from

Gatorade. The ingredient, which is patented as a flame retardant, is used to evenly distribute colour throughout several drinks, and is not unique to Gatorade alone. And while this brominated vegetable oil is deliberately used in artificially-coloured beverages, little media attention is given to flame retardants that haphazardly find own their way into human food supplies. As products containing PBDEs begin to degrade and release the compound into the environment, PBDEs migrate across distances and find ways into food sources such as red meat, fish, and cow's milk.[51] Human diets are the primary avenue of contamination.

We are fireproofing our breasts from the inside out, as PBDEs inevitably find their way into our breast milk. American body burdens of flame retardants are three to thirty-five times higher than people living in some small European countries, and an analysis of breast milk in 2003 reported that American women contain the world's highest concentrations of PBDEs.[52] Since the compound distributes through tissue based on fat concentration, the high fat content of breast milk increases an infant's potential exposure. A mother is believed to be a child's greatest source of exposure to PBDEs, both prenatally and through breast milk.[53] High PBDE concentrations in children as compared to adults was also noted in a study of a California family of four, whose toddler demonstrated ten times the level of PBDEs as his parents, spurring the authors to note that breastfeeding contributed "significantly to the higher levels of [some particular PBDEs] observed" in the child.[54] A study conducted by Spanish researchers and published in *Environmental Science and Technology* tested the concentrations of PBDEs in children's blood. The research suggested that the determining factor for body burden of PBDEs in children at four years of age was breastfeeding, even with relatively short

breastfed periods.[55] With levels of PBDEs in human breast milk doubling every five years,[56] fears surge that future levels of the flame retardant in milk will eventually surpass those of PCBs.

Fire-proofing comes at a cost: In California, a state with very strict consumer safety standards for flammability, PBDE levels in children are ten- to one-hundred-fold higher than children across the country, and two- to ten-fold higher than adults.[57] Although flame-retardants may add several seconds before combustion, "the chemicals make the smoke, soot, and fire worse by releasing other by-products like dioxin, a known human carcinogen."[58] When there is fire, the fire is a toxic one.

Two PBDEs, the Penta-brominated and octa-brominated types, have been cause for a sufficient amount of concern that their use is being phased out. There is also a voluntary phase-out in the US of the deca-brominated kind by 2014. However, these compounds are being replaced by Firemaster 550 flame retardants, which show evidence of reproductive harm and DNA damage, though better evidence will not be available until more research is dedicated to their effects on animal health.[59] It seems as though we have all been taught that there is a hierarchy of things of which to be afraid, and our fear of fire supplants all other rational thought regarding the health of children and adults alike.

My mother is part tin can liner: BPA

Chris Jordan's forthcoming film *Midway* tells the story of refuse, distances, and the futility of good intentions. On the tiny island of Midway Atoll in the North Pacific Ocean, albatrosses fleck the landscape and paint streaks in the sky, craning their beaks upwards in alien communication rituals. Despite the beauty, Jordan's work tells a more

sinister tale, as the decayed bodies of birds on the tiny island's beaches are captured in photographs and on film, and are imprinted upon anyone who is brave enough to look. Opening up the soft stomachs of newly-dead chicks, the images reveal a human history of consumption and waste. Kaleidoscopes of chromatic plastics fill the hollow stomachs of these babies, now more plastic than bird: bottle caps, cigarette lighters, syringes, Legos, toothpaste lids, and toothbrushes. Fishing nets, nail polish applicators and tampon applicators mixed with spine and bone, all where an albatross once was. Thousands of plastic pieces—each one singularly insignificant—are cumulatively lethal. The pieces of plastic, too large to digest, embed themselves everlastingly inside the birds. Mother albatrosses suffer from misinterpretation: unable to distinguish between food and hazards, they feed their babies fragments of our plastic lives found floating on the ocean's surface in an enormous synthetic gyre. Our plastic conveniences kill approximately one-third of all baby albatrosses born on Midway. These mothers are ignorant of the harm they bequeath upon their young.

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We know Bisphenol A, or BPA, for its simultaneously useful and threatening plastic properties, but its history in the twentieth century begins with mimicry and female hormones. Although the compound itself had been around for forty years, in the 1930s, medical researcher Edward Charles Dodds was looking for a synthetic estrogen and subsequently unearthed the estrogenic properties of BPA. Although only used for a short time as an estrogen replacement, BPA's pedigree has an interesting tangential story: it became the predecessor of DES, diethylstilbestrol, a compound Edward Dodds referred to as the "mother substance."[60]

Synthesized in 1938, DES' initial reports suggested that its properties would be beneficial for the practice of gynecology.[61] At a time when natural estrogen was used to alleviate menstrual cramps, regulate menstruation, and ease menopausal symptoms,[62] DES was a welcomed and inexpensive alternative. Artificial estrogen was also available as an oral supplement, and its elevated potency meant fewer doses were needed. Despite concerns over its carcinogenic properties, DES was prescribed to women for over thirty years, until its use for pregnant woman was banned in the United States in 1971—and banned completely in 1979—"after the first epidemiological studies reported rare vaginal cancers in young women exposed to DES while in their mothers' wombs."[63] The mother substance proved detrimental to mothers and daughters alike. Its antecedent BPA, however, is alive and well.

BPA improves the mechanical properties of plastics, and thus it began to see widespread applications, beginning with the fabrication of polycarbonate plastics and epoxy resins in the 1950s. Such resins are used in drinking bottles and dental sealants,[64] as well as tableware, coating for purchase receipts, and adhesive labels.[65] In our modern world, BPA can be found in countless household products, like CDs and DVDs, cell phones, bike helmets, laptops, electronics, eyeglass lenses and frames, and plastic food storage containers. As Florence Williams discovered,

> phthalates [such as BPA] are everywhere. Since they bind fragrances, they're often present in our shampoos, soaps, and moisturizers. They are an important ingredient in softening polyvinylchloride (PVC), so they waft out of things like shower curtains, plastic toys, and fake leather. There's more fake leather lying around than you think.[66]

BPA is also in the lining of tin cans, which is relevant for a country whose number one food trend in 2010 was incorporating a canned food into their meals.[67] The cans we do

not consume sit for years in our pantries, plastic lining mingling with future meals, waiting for food shortages or power outages ("break in case of emergency"). Its versatility has certainly precipitated its extensive use, as it is one of the highest volume chemicals manufactured globally. In 2003, production of BPA was 6.4 billion pounds, "with a 6–10% growth in demand expected per year."[68] BPA's production garners annual profits exceeding 6 billion dollars.[69]

As expected, BPA has found its way into human breast milk. Interestingly, half-lives of phthalates are relatively short, between hours and days, and therefore are quickly metabolized and expelled from the body.[70] Their persistence in our fat stores and breast milk is not owing to their molecular persistence, but rather their enormous presence in our daily lives. They do not represent the chemicals of yesterday, but are the chemicals of now, the ones that find their entryways through the objects we touch and the dinners we eat.

The definitive effects of BPA on humans are inconclusive, partly owing to the lack of research studies conducted on human participants. As Professor Veranth pointed out to me, the challenge with these types of studies is that laboratories typically test tens to hundreds of animals, exposing the groups at high levels to get a statistic between a treated and untreated animal. "With these environmental toxins," he explained, "we're talking about exposing 300 million people in the United States or 7 billion people worldwide to much lower levels. But if you're exposing 7 billion people, even a one in a million risk is a lot of affected people."

Because children, on a pound-for-pound basis, eat, drink, and breathe more than adults, they have elevated intakes of environmental contaminants. In a 2006 study

measuring concentrations of BPA in colostrum, researchers obtained milk samples from 101 healthy mothers within three days after delivery. In the colostral samples, testing garnered results showing higher levels of BPA than in a similar study conducted earlier that year involving blood samples. The researchers concluded, "it would be of great importance to minimize the risk of maternal exposure to BPA."[71]

In April 2008, the government of Canada banned the import and sale of baby bottles containing BPA, classifying it as "toxic" under the Canadian Environment Protection Act.[72] Four years later, the United States followed suit when the FDA banned BPA from baby bottles and sippy cups. It is a tragic irony that, until very recently, safe alternatives to BPA-laced baby bottles were BPA-laced breasts. The mother's breast: the suckling infant's first canteen.

The versatility of BPA is troubling when we consider that its first purported benefit was as an artificial estrogen. In her examination of Bisphenol-A, Florence Williams asks a poignant question:

> BPA was proved eighty years ago to act as an estrogen. You might wonder, as I did, why on earth, if BPA was known to behave estrogenically, did it go on to become the principle ingredient in ubiquitous polycarbonate plastic, an ingredient known to break down easily and escape into the environment?[73]

There is no cogent or tolerable answer. The reason for the compound's pervasiveness, and for the endurance of many potentially-harmful substances, may perhaps be found somewhere in between toothless agencies, government apathy, biased Supreme Court Justices, and the incontestable influence of the chemical industry in America.

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PCB, PBDE, BPA—inside my breasts linger an alphabet soup of chemicals that I

will never palpably perceive, unless the soup expresses itself in other malevolent ways. The explosives used for the attack on the Marine Barracks in Beirut contained the equivalent of 12,000 pounds of TNT. Estimates suggest that there are 46,000 pieces of floating plastic in every square mile of the world's oceans.[74] Every day, 21 million tons of carbon is emitted into the atmosphere. Each year, 50 million pounds of PBDEs[75] and 2 million tons of BPA[76] are produced. Numbers are imperceptible; invisibility is ethereal. Synthetics disguise themselves as oceans and sky and flesh. Bodies of the earth conceal peril. Venom impregnates itself where it can.

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V

VECTORS

Of course there are mothers,
squeezing their breasts
dry, pawning their bodies,
shedding teeth for their children,
or that's our fond belief.
~Margaret Atwood, "Red Fox"

Women's bodies are venues of chemical dances. Much of what penetrates—what implants itself—does not remain fixed. Synthetic compounds oscillate between the outside "boundaries" of our skin and the inside folds of our tissue. Some biodegrade and depart within hours, while others become established guests, persisting for years. This inward and outward migration of environmental toxins is a lifetime affair. For many women who choose to breast feed, their bodies become vaults for synthetic compounds, and, as the release of lifetime body burdens is expedited, maternal vessels become vectors of contamination and very palpable threats.

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For seemingly negligible levels of contaminants in breast milk, the human endocrine system plays a pivotal role in the narrative of maternal vectors and infant harm. The endocrine system consists of a group of glands in the body that produces hormones; these hormones regulate a person's growth, metabolism, and sexual development and function. Finding passage in the bloodstream, hormones are transported throughout the body to tissues and organs. Inversely, endocrine disruptors—EDs—are foreign chemicals that mimic or interfere with hormones, confusing the complex signaling systems of the body.[1] Within the framework of conventional discourses on toxicity, endocrine disruptors contradict our understanding of risk.

"The dose makes the poison": a familiar locution that characterizes the simple approach to chemicals and their capacity to be distinguished as toxic. Measured and labeled, the body's chemical defense system is charted onto a dose response curve, a graphed rigid "S" figure denoting that a substance's harmful properties are only reached when the substance accumulates at sufficient concentrations in the body. Yale

University's Chemsafe site explains that

> The toxic effect of a substance increases as the exposure (or dose) to the susceptible biological system increases. […] If the dose is low enough even a highly toxic substance will cease to cause a harmful effect. The toxic potency of a chemical is thus ultimately defined by the dose (the amount) of the chemical that will produce a specific response in a specific biological system.[2]

In *Toxic Bodies: Hormone Disruptors and the Legacy of DES,* Nancy Langston, an environmental historian and professor of Forest and Wildlife Ecology, illustrates this assessment of toxicity using the example of a poisonous mushroom: a larger dose of a toxic fungus would cause more harm than a small amount.[3] However, EDs resist this definition of toxicity through four main properties: dose, threshold, age, and timing. First, unlike traditional poisons, endocrine disruptors may cause more harmful effects at lower doses. Second, chemicals are generally believed to have a threshold of safety, a level at which even poisonous substances are considered inconsequential. By contrast, EDs do not have this threshold, and perform at low doses in comparison to other toxins: "Even a single molecule diluted in a trillion molecules of water may have potential activity."[4] Third, body weight and size of a contaminated individual matter less than does their age. Often, someone heavier or larger can consume higher doses of a toxin before adverse effects are exhibited. Instead, EDs are most harmful based on age, as infants and developing fetuses are at the greatest risk. Finally, the effects of endocrine disruption often do not express themselves immediately, but can manifest as disorders decades after exposure.[5]

To better understand the function of hormones at a cellular level, I consulted Markus Babst, Associate Professor of Biology at the University of Utah, whose general field of research is cell biology. Drawing me a simplified diagram as a graphic aid, he

explained that receptors usually sit on the cell's surface, and when signals (small proteins) arrive, they bind to the receptor and create a "signaling cascade," which brings a signal to the nucleus. Rather than waiting on the surface, endocrine disruptors that mimic hormones (like estrogen) penetrate cellular walls. "A very important aspect of these molecules," Babst explained, "is that they can pass through membranes because they are partially hydrophobic, meaning they like fat, and partially hydrophilic, meaning they like water. So these molecules are okay in both environments."[6] Able to diffuse freely from blood through cell membranes, EDs distribute through the body very rapidly: violent penetration at a molecular level. An ED will reach the cell's nucleus, where there are cell receptors that these hormones will bind to, which produces the expression of certain genes. Almost every gene in your genome is under some control: "The gene is present in your chromosome, the actual physical DNA piece is there, but it is not being used." Once it binds to the receptor in the nucleus, the hormone (or mimicked hormone) now has a number of target genes it will "up-regulate," or activate. "This is highly simplified," Babst reiterated, "and this hormone is just a part of a highly complex network of regulation which is going on." Despite not naming any particular contaminants, he explained that the sensitivity of these hormonal signals is high, which is perhaps part of the problem why even small concentrations of a contaminant can affect gene expression.

Endocrine disruptors, these hormone-mimicking synthetic chemicals, are duplicitous. They are Trojan Horses at a molecular level: microscopic penetration and diffusion. Although the presentation of mother's milk to her infant is benevolent, the invaders that pour from the belly of her offering have menacing purposes. Within the migration through a mother's body, a Trojan Horse is first accepted into the breasts and

then reproduced for the suckling infant. Deviants cloaked as friends penetrate membranes and alter the nucleus of the cell, the nucleus of the intimate ritual of feeding.

In breast milk, EDs evade the chemical defenses of women's bodies and accumulate in their fat until pregnancy.[7] The time during development and early childhood is when cells are rapidly reproducing, and is therefore the period when humans are most vulnerable to external chemical threats. The immunologic, neurologic, and reproductive systems are immature during infancy, and as an infant's tissue is rapidly growing, the infant's body consequently requires a significant amount of calories and fat consumption. Because of these circumstances, the consumption of contaminated breast milk can create potential risks. When fed to a child, the infant's body has no response mechanism because cells are disposed to receive hormone messages. The body "responds to the impostors as legitimate messengers and allows them to bind to hormone receptors; it does not recognize their action as damage that needs to be repaired."[8] As particular hormones operate at parts per billion and parts per trillion, the equivalent subjection of cells to synthetic hormones exposes the vulnerability of developing bodies to chemical disruption.

Generationally, the 1950s produced the first children exposed to synthetic chemicals in the womb, an exposure at elevated levels because of the extent of chemicals that came out of World War II. By the 1970s, that generation of people were having their own children. It was during this decade that diagnoses of neurodevelopmental disorders that had been rare in the past began to increase.[9] This is not say to that parents passed on altered genes to their children, but rather that accrued contaminants—potentially endocrine-disrupting compounds—were possibly transferred to infants in utero and

through breast milk. A review conducted in 2011 maintains that many of the listed endocrine disruptors are pesticides and herbicides, although phthalates and flame retardants are also in this toxic scene; additionally, forgone synthetic chemicals, like polychlorinated biphenyls, are retroactively being admitted into this notorious collection.

PCBs have exhibited endocrine-disrupting activity.[10] Research conducted on humans has established a link between PCBs and learning deficits and neurobehavioral effects,[11] while prenatal exposure is associated with impaired mental and motor development, and poor cognitive functioning and short-term memory function.[12] Although is difficult to conclusively confirm the effects that PCBs in breast milk have on suckling infants, precursory evidence indicates that perinatal exposure to PCBs may disrupt thyroid hormone regulation.[13]

As hormones work with the immune system to regulate healthy body regulation, EDs have also been attributed to impaired immune function.[14] A Dutch study in 2000 concentrating on PCBs looked at the health of 400 infants born between 1990 and 1992. Results indicated subtle changes in immune cells at 18 months, suggesting a possible deficiency in immune responses to infection. At three years of age, researchers concluded that "the effects of perinatal background exposure to PCBs and dioxins persist into childhood and might be associated with a greater susceptibility to infectious diseases."[15] Body burden influenced mainly by lactational transfer showed a higher prevalence of chronic middle-ear infections and common viral diseases, as children with high body burdens of PCBs were eight times more likely to contract chicken pox and three times more likely to develop ear infections.[16] The authors concluded: "the positive effects of breastfeeding on recurrent middle-ear infections was counteracted by the negative effect

of PCB exposure."[17]

The potential risk associated with PCB exposure is also evidenced in the Inuit population, as endocrine disruptors found in breast milk mean that Inuit children have exhibited issues with their own immune systems: their bodies do not produce the necessary antibodies when they are vaccinated for smallpox, measles, polio, and other diseases.[18] Breastfed infants whose mothers had high chlorine compounds (like PCBs) in their bodies had an 80% higher chance of contracting a middle-ear infection than children of the 2000 Dutch study.

A growing body of literature suggests that chemical flame retardants, like PBDEs, have endocrine-disrupting properties that affect hormone function and damage the brain during stages of development. When young rodents are exposed to brief periods of PBDEs, their learning can be mildly impaired, while exposures at later intervals in life have delayed puberty in the male animals.[19] Laboratory research has also indicated the potential for PBDEs to "profoundly affect" sexual development and sexually dimorphic behaviours.[20] The Environmental Working Group has released information regarding human breast milk and PBDEs. Research shows that the compound can cause problems with sensory and motor skills, memory, learning, and hearing in fetuses exposed to the neurotoxin, even in minute doses.[21] As we gradually coat all of our household belongings in flame retardants to avoid risks of fire, we might want to prioritize ancillary risks to human health.

Originally manufactured as a synthetic estrogen, BPA has the ability to alter proper hormone functioning. In a report published by the National Institute of Health in 2007, the authors raise concerns regarding assumed safe levels of BPA in human

populations, even in small quantities. Describing the adverse effects in laboratory animals exposed to low doses of BPA, the authors catalogue issues including an increase in prostate and breast cancer, early puberty in girls, type 2 diabetes, obesity, and neurobehavioral problems such as attention deficit hyperactivity disorder (ADHD). The report also warns that effects are irreversible, and many health adversities may not express themselves until much later in one's life.[22]

In 2008, the National Toxicology Program US Department of Health and Human Services also published a report entitled "Potential Human Reproductive and Developmental Effects of Bisphenol A," and concluded that they have "some concern for effects on the brain, behavior, and prostate gland in fetuses, infants, and children at current human exposures to bisphenol A."[23] Their report acknowledges that BPA is more commonly described as "weakly" estrogenic, but studies suggest that the compound may interfere with cellular receptors that dictate the body's signaling systems that are crucial to proper development. The report continues:

> a variety of effects related to neural and behavior alterations, potentially precancerous lesions in the prostate and mammary glands, altered prostate gland and urinary tract development, and early onset of puberty in females have been reported in laboratory rodents exposed during development to much lower doses of bisphenol A that are more similar to human exposures.[24]

In such cases of low-dose exposure, "low-dose" itself refers to levels (of BPA) that are below the amounts used in toxicological testing for health concerns and risk assessment. More importantly, "low dose" is commonly used in reference to environmentally relevant doses, such as levels found in human serum.[25] Therefore, while contaminants at small levels are often referred to as insignificant to human health, the science of low-dose exposures indicates that, for EDs, there may not be trivial levels.

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When the Greeks descended upon Troy once the city had fallen, soldiers found Astyanax, son of Andromache and Hector (the Prince of Troy), hiding in his father's tomb. The soldiers debated whether to let him live. Worried that Hector's son would grow old and avenge his father's death, Neoptolemus grabbed the boy and tossed him over the wall, to his demise. It seems to me there is a malevolent casualness paralleled in the story of Astyanax, a discarded child, and in the lack of government and industry's honest and serious regulation regarding potentially toxic chemicals.

At present, endocrine disruptors are not a priority, at least not enough for the development of standardized screens that assess chemicals for their potentially endocrine-disrupting effects. Because of this lack of consistency, no systematic testing has been done on the myriad of chemicals in use today.[26] Tests performed by chemical manufacturers have been conducted on sexually mature animals, whereas few analyses have been done on the effects of compounds on the developing biological systems of infants and children.[27] Moreover, in traditional toxicological tests, the doses of EDs used are one thousand to one million times greater than the values at which the endocrine system operates, and are also higher than real-world, everyday exposure to these potentially harmful compounds. Researchers also test using dose amounts that "far exceed the normal threshold or peak concentrations at which negative-feedback control from the brain shuts down cellular responses."[28] In other words, the "toxic" levels of EDs are low levels that evade the body's responses to foreign threats. There is some progress in the field, with newer ED-detecting methods being developed, but the process to systematize these tests will take time, and response to the discourse of endocrine

disruption is already, as I see it, long overdue. As Florence Williams poignantly writes,

> The whole prospect of trying to individually safeguard one's family from silent endocrine disruptors feels like a folly, because it can't be done in any meaningful way until the government and chemical companies change the way they test, manufacture, and market these substances.[29]

With the plastics industry growing at a rate of 12% per year, and with the EPA registering approximately 875 active ingredients as pesticides,[30] industry seems to be progressing faster than tests designed to protect welfare of the human and nonhuman world. Sometimes, as with the matter of endocrine disruptors, it is valuable to keep in mind that external threats impede natural function.

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In the days after the terrorist attacks on September 11th, 2001, which killed nearly three thousand people, mothers across the country were complaining to their doctors about nipple pains, newly-fussy infants, and declining production of their milk. Reports from mothers in neonatal intensive care units confirmed that the production volume of milk had plunged rapidly, and beliefs, although speculative, circulated that the phenomenon was owing to stress exhibited because of the events of Tuesday morning.[vi] Meditating on her own experiences during that week in 2001, Sandra Steingraber writes:

> On September 11, terrorism reached nursing mothers across continents. Entered their milk. Entered their babies. Terror was inside us now, Elijah and me. The connections between the political events in the outside world and the interior ones within the ducts and lobes of my own body were more profound and intricate than I had ever imagined.[31]

The permeation of planes into buildings caused a multiplication of death and crisis, as

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[vi] For further reading on possible link between stress and milk production, see Lau, C. "Effects of Stress on Lactation." *Pediatric Clinics of North America* 48.1(2001): 221-34.

foreign stresses had impressions upon individuals. Imbued with panic, bodies seized: perhaps lactating breasts have an intuition of their own. If the speculation regarding trauma as a source of lactational atrophy is at all possible, then the bodies of women affected during that solemn week became crossroads for love and nourishment and fear and terror.

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When a woman becomes a mother, she fluctuates from vessel to vector. Veiled in ideological significance, these vectors lead to shifting connotations of the mother figure. Environmental assaults precipitate a movement away from "mother" as a nurturing figure to "mother": caring and contaminating. A woman's body is contaminated; a mother's milk is impure. The polluted mother complicates the mother archetype, the woman bound to care. Of course, this is not to say that mothers have been rigid figures up until now: they have been nurturers and sexual beings and stay-at-home moms and working professionals. But there is an ethic of care that I believe is attributed to mothers, which, in light of breast milk contamination, is fractured.

We have accepted, perhaps on some level, that we are all toxic bodies living in a contaminated world. If we have not acknowledged our own impurity, it is overdue. Yet it has been a struggle to concede the contamination of my mother, or me-as-mother, and, more importantly, to accept her duplicitous role as loving and unintentionally sinister. Of the sexual nature of women, Elizabeth Grosz writes

> Can it be that in the West, in our time, the female body has been constructed not only as a lack or absence but with more complexity, as a leaking, uncontrollable, seeping liquid; as formless flow; as viscosity, entrapping, secreting; as lacking not so much or simply the phallus but self-containment […] a formlessness that engulfs all form, a disorder that threatens all order?[32]

Although this theory applies to the sexual body, I propose that it can also be relevant to the modern mother. In a toxic world, our collective construction of a mother who is uniquely caring has precipitated her eventual formlessness. She is not one-dimensional, not stable, not as monolithic as we may have supposed. Through the pollution of her milk, she herself becomes fluid. She is liquid through liquid. She belongs to several realms. The seepage Grosz writes about seems liberating, though I suggest that the fluidity of the mother in this context is not liberating, only because her mutability comes from outside of herself. What generates her multidimensionality is a physical trespass that is forced upon her: meaning has opened her up, she is exposed as a collection of things, but it is not of her own will.

The legacy of contamination is further tainted by the unloading of lifetime body burdens of chemicals from mother to child. A mother does not only pass on potential environmental threats, but also empties much of her toxic stores onto her suckling infant. Researchers estimate that mothers unload between 20% and 70% of their lifetime body burdens of persistent organic pollutants onto their infant during the first six months of breastfeeding.[33] Stored in her lifetime supply of fat, a mother's toxins are depleted, unbeknownst to her, at the potential expense of her child's health. Estimates suggest that when breastfed individuals reach adulthood, they will have accumulated a dose of dioxins 3% to 18% higher than those who were not breastfed.[34] Mothers disburden themselves by burdening their infants.

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Contaminated mothers are transcorporeal. Transcorporeality is borne out of contemporary practices, as it "opens up a mobile space that acknowledges the often

unpredictable and unwanted actions of human bodies, non-human creatures, ecological systems, chemical agents, and other actors."[35] A mother's body is this mobile space: a sphere of movement between the outside and the inside, an inhale and exhale of the synthetic and natural worlds. The body retains and expels—it is a vessel and a vector. The space occupied by a mother who passes on pollution is a space remade, which blurs the intuitive lines of the human body, so that the corporeal self has intimate interactions with passive household objects. And not just vulnerable to material things, mothers are vulnerable to shifts in significance, as the good intentions of their acts of child rearing are perverted by illness and potential disorders.

My mother's body is a continuous space: she is structure that dissolves the inside and out, she is Mies Van der Rohe's Barcelona Pavilion; she is a leaking roof, a broken window, a cracked concrete foundation.

Notes

[1] Theo Colborn, "Neurodevelopment and Endocrine Disruption," *Environmental Health Perspectives* 2004: 944.

[2] Chemsafe, "The Dose Makes the Poison," Yale University 2013, 3 Dec. 2012.

[3] Nancy Langston, *Toxic Bodies: Hormone Disruptors and the Legacy of DES* (New Haven: Yale University, 2010): 5.

[4] Ibid.

[5] Ibid.

[6] Markus Babst, Personal Interview, 1 Mar. 2013.

[7] Langston, 9.

[8] Colborn, *Our Stolen Future*, 205.

[9] Colborn, "Neurodevelopment and Endocrine Disruption," 944.
[10] Risheng Ma and David A. Sassoon, "PCBs Exert an Estronogenic Effect through Repression of the Wnt7a Signaling Pathway in the Female Reproductive Tract," *Environmental Health Perspectives* 2006: 902.

[11] United States Environmental Protection Agency. *Health Effects of PCBs.*

[12] Mead, 430.

[13] Krista Nickerson, "Environmental Contaminants in Breast Milk," *Journals of Midwifery and Women's Health* 2006: 30.

[14] e.hormone, "Endocrine Disruption Tutorial: Human Effects," Tulane University 2012, 8 Feb. 2013.

[15] Nynke Weisglas-Kuperus, et al., "Immunologic Effects of Background Exposure to Polychlorinated Biphenyls and Dioxins in Dutch Preschool Children," *Environmental Health Perspectives* 2000: 1203.

[16] Ibid., 1204.

[17] Ibid., 1205.

[18] Colborn, *Our Stolen Future*, 107.

[19] Ralof, "Don't Bite the Dust."

[20] Ernie Hood, "Endocrine Disruption and Flame-Retardant Chemicals," *Environmental Health Perspectives* 2006: 113.

[21] Sonya Lunder, et al., "Toxic Fire Retardants (PBDEs) in Human Breast Milk," *Environmental Working Group* Sep. 2003, 4. Mar. 2012.

[22] National Toxicology Program, *National Institute of Environmental Health*, "National Institutes of Health. Audit of literature cited and fidelity of requested changes to draft bisphenol A expert panel reports," 24 Jul. 2007: 12.

[23] National Toxicology Program Department of Health and Human Services, vii.

[24] Ibid., 7.

[25] Richter, 202.

[26] Colborn, "Neurodevelopment and Endocrine Disruption, 944.

[27] Wargo, 12.

[28] Ibid., 949.

[29] Williams, 140.

[30] Colborn, "Neurodevelopment and Endocrine Disruption," 944.

[31] Sandra Steingraber, *Raising Elijah: Protecting Our Children in an Age of Environmental Crisis* (Philadelphia: Da Capo, 2011): 19.

[32] Grosz, 203.

[33] Nickerson, 209.

[34] Ibid., 208.

[35] Stacy Alaimo, *Bodily Natures: Science, Environment, and the Material Self* (Bloomington: Indiana University, 2010): 2.

VI

VOICE

You can never make that crossing that she made, for such great voyages in this world do not any more exist. But every day of your lives, the miles—that voyage from that place to this one—you cross. Every day! You understand me? In you, that journey...is.

~Angels in America

Legacy: the things delivered throughout generations. Legacy is a ghost from the past, a shadow of an earlier age, an offering for the future. It maneuvers, it journeys, it progresses. Legacy migrates.

Migration is in my blood. It is woven into my history, into the laces of my shoes. It defines where I have come from, and where I will be. My parents are modern-day immigrants, the kind that came over on planes, not boats. They left behind the burnt fields, unreliable trains, and uneven stone roads of Southern Italy. They stretched their roots across oceans, delicate strands intertwined like rope. My genealogy is a rhizome.

Ancestors coalesce in my veins, a lineage of mothers and fathers bequeathing vestiges of simplicity. My father was born in a small community of antiquity, a town on the easternmost hill of the Apennines, a mountain range that runs north to south, forging Italy's central spine. It is a town where most interior streets are just wide enough to allow donkeys to pass, where half-century old stone houses sit atop of one another so that neighbors share walls and roofs and confidences; it is where both my grandparents lived and died. My mother, instead, was born in a larger city of six-storey buildings, a town where iron balconies face the main streets while drying clothes hang from lines that canopy interior alleyways. Palm trees edge the main thoroughfares, ascending above wooden benches that serve as meeting places for the old and young alike. In 1943, the Allied Forces bombed the city on nine different occasions in order to cripple transportation routes in Southern Italy; within my lineage are remnants of war.

Immigrants to Canada in the late 1960s, my parents endowed upon me new opportunities on new soil. For my two sisters and me, they stressed work ethic, earning an honest living, and the value of making things with your hands. They passed on an old

world imparted in the light of a new world, a better country with more opportunities, and a Latin language to add to my mother tongue. For them, their migration indicated an escalation of success. But just as legacy constitutes ideals and values, it is also made up of tangible gifts and corporeal endowments. My Italian inheritance is as much in my body as it is the things that I do.

My mother's home town is situated on a plain known as "the granary of Italy," while my father's home town is nestled in the mountains, an "island" surrounded by miles of cultivated fields in every direction. When my parents picked up and transplanted themselves to Canadian soil, the vegetation was transplanted as well. Despite climate challenges that come from drastic temperature variations between Canadian and Mediterranean environments, they adapted. Take a walk through the streets of Little Italy in Toronto and you will witness rows of wooden stakes rising above backyard fences, holding up tomato plants and grape vines. I spent the first 20 years of my life traveling back and forth from a home in the suburbs of Toronto to a cottage on a farm, where spring is spent cultivating a large garden and autumn is spent reaping the rewards. I have been eating organic foods before I knew the word "organic." We battled weather and modified crop selection but persevered, recreating a cultural and material lineage on foreign soil, soil that became local once we thrust our hands into the earth. Although family histories dilute over time, residues of agricultural rituals linger. I descend from a line of people who grew cucumbers or made their own pasta or sold fresh tomatoes at the market. Pride in my ancestry is partially rooted in knowing that the food my people consumed was authentic and good—they were doing it right.

For me, mother's milk is part of this ancestry. I concede that it is an unorthodox member of my gastronomic heritage, an atypical part of the Mediterranean diet. And yet, in its simplicity and its connection to my physical lineage—to the bodies of the women from whom I descend—milk tethers me to the past, while my own breasts bring forward my mothers into the present. But research has faced me with the uncertainty of an unsullied history; my lineage, I fear, has been tainted by modernity.

In my mind, my descendents were unencumbered by chemical trails, but this "purity," I found out, ended in the twentieth century. I discovered that DDT was widely used in Italy between 1943 and 1944 to control an epidemic of typhus in Naples.[1] The city of Naples, which is cradled on the shores of the Tyrrhenian Sea, sits just 108 miles from my mother's hometown. My research also uncovered that Italy was one of two main locations of the manufacture of PCBs. Caffaro, a company located in Brescia, a city in Northern Italy, began the production of PCBs in 1932, until manufacture was banned fifty years later in 1983, the year of my birth. A study in 2012 found that residents of Brescia have twice the levels of PCBs in their blood as their French neighbours, and ten times the PCB levels of Americans. In a 2008 study, a woman who grew up in the Caffaro district was tested for PCBs, and her breast milk contained twenty-five times the levels that the World Health Organization cautions against.[2] Brescia is 110 miles from Bolzano, a city heralded as "the gateway to the Dolomites," and is where my mother lived with her family between 1962 and 1970, before moving back to the South. Chemicals do not obey borders, and so I am concerned over my own mother's proximity to the comprehensive uses of these notorious substances. If PCBs can traverse thousands of miles to find the Inuit, they can surely make the hundred-mile jump to my mother's

home. Perhaps it is unlikely that either of these chemicals would have found asylum in the breast milk of my grandmother in time for her to pass them onto her children, but they may very well have concealed themselves inside my own mother. When I began my research, never would I have supposed that the headwaters of my heritage would also be a birthplace and dumping ground for the reviled chemicals that contaminate my own tissue. I had supposed a pure lineage, but industrial history has tainted those lines. The pollution of my mother's body is already within the fibers of my own.

Contaminants in our homes and in our milk have accrued. I imagine pure lines of breast milk slowly tarnishing over time. The milk of my great-grandmother was less contaminated than the milk of my grandmother, which was less contaminated than the milk I was fed by my own mother. The taint accumulates. And me? I have carelessly assumed risks. I still occasionally buy food in tin cans and drink bottled water when I have forgotten to bring my own container. For three years, I worked in the family business, a glass manufacturing company, where I mixed and poured polyurethane to be used in bullet-resistant glass. I may have exposed myself to higher levels of BPA than the average woman; perhaps somewhere in the seaweed chaos of my breasts, an endocrine disruptor, or a possible carcinogen, lies in wait. What was passed onto me from the birthplace of my ancestors—and the birthplace of the Colosseum and Michelangelo and Dante—has fallen on my doorstep. But the contamination of my breasts pushes back against generations of untainted bodies. I feel that I am the beginning of contamination, and based upon the persistence of many synthetics, what takes one generation to do will take three generations to undo. Even if the use of all potentially harmful chemicals ceased

today, my great-granddaughter would still have within her the leftovers of my carelessness. Contaminants fracture legacy, splintering its course.

Like my parents, I, too, am an immigrant, an outsider on new land. I see the contours of my ancestors, belongings in tow, marching up the hillside. Like them, I have climbed into the mountains by necessity, and by resolve. You see, my lineage isn't fortified just by the all the people who stayed in Southern Italy, but also by all the people who left. And through these demonstrations of migration I am keenly aware of the fluidity of bodies, the ease at which objects traverse across space, whether they be people navigating oceans or particles moving through regions. I embrace migration, but I also curse it. Contaminants born far from where I breastfed, far from where I lay my head today, make great migrations to find me. They follow the latitudes of my anatomy and discover my breasts. They breach borders. As I traverse landscapes, they traverse with me. Our bodies are Ellis Islands unfixed. I cannot escape this chemical diaspora.

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A word about guilt.

Perhaps an argument could be framed that the disclosure of tainted breast milk is as much a charge against indiscriminate chemical practices as it is an indictment of mothers who negligently contaminate their children. When I spoke to a woman at a Christmas party about this very subject, she summarized our conversation by caustically telling her friend "Apparently I've been poisoning my kids." Contaminants not administered through breast milk instead find avenues in food; as family meals are often the "domestic realm" of mothers, blame is transferred from milk to shopping lists. Women are users of plastics and flame-retardants and pesticides. Women are consumers.

But they are also consumed, and the consumer's body becomes food for its young, as infants drink life-long stores of fat and pollution. This matter of contamination is just one more way women are meant to feel guilty, and blame is layered upon conceptions of maternal obligations. We are Helens of Troy, the focus of anger and condemnation. I shamefully admit that I, too, fluctuate between sympathy and blame. In an era dubbed "the information age," knowledge regarding common household chemicals is accessible, and ingredients of store-bought foods are one Google search away. The message is clear: good mothers don't risk the health of their babies.

But no. So often, information is kept from us. Full disclosure regarding the use of allegedly safe chemicals is not always compulsory, nor is knowledge necessarily accessible. Also, many women have no authority over the regulation of the environments where they work and the communities in which they live. We cannot hide ourselves from the chaotic journeys of chemicals that find their way in through our pores, planting seeds of contamination in our bodies. Growing up Catholic, I know all too well the burden of guilt. Here, the virtuous objectives of a mother wanting to nourish her infant should not be corrupted by external assaults. While the ritual is sullied, the intent is not.

Rather than having this be a chemical story of blame, it can be one of reclamation. Instead of focusing on what we cannot control, we should start by controlling the things we can. We can choose not to willingly accept into our bloodlines potentially harmful compounds found in goods that are unessential; we should sever our toxic habits. Out of the 5500 mammal species whose milk may be threatened by the dispersal of synthetic chemicals, we are the only one who can elect not to be poisoned. Rather than having our bodies be landscapes of war, they can be landscapes of resistance. Women: mothers,

future mothers, daughters of mothers and sisters of mothers. It is time to restore our voices.

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Legacy does not end with us, but is carried by us, and through us. Heritage is embodied, and when I fed upon my mother's milk, I tasted a lineage she endowed upon me: I drank my ancestry. Migration creates distances, but it brings me closer to home. It also brings the outside in. I carry the landscapes of my ancestors within the folds of my skin, and under my fingernails. My foremothers are threaded through generations, and as milk is passed on, the lines are obscured between where I end and where my mothers begin.

Like lineage, my contamination is shared. And yet, just like my story of migration, I claim it as my own. The task of environmental atonement is solely mine. I claim my own authority, and ask women to make the same claim, and find their own voices within a toxic landscape that smothers their rights, suppresses their bodies, and poisons their children. I don't want to be a modern-day Cassandra writing a doomsday story.

I speak in a woman's voice, in the voice of a daughter, a lesbian, and, maybe, a future mother. But I am not a mother. And the choice for *me* to become a mother involves extraordinary consideration and unequivocal choice. Before then, I will need to know who I am, and what I will bestow. If I fail to make inquiries now, I might one day be faced with questions that I cannot answer.

I am culturally Italian, first-generation Canadian. My breasts are part tissue and part fat, part chemical, part deodorizer, part dashboard and pesticide and black vinyl chair

in my living room. How many parts woman am I? The contamination of breasts, the poisoning of milk, leaves me grasping for something that still remains uniquely mine, something that is me, and no one else. It is a sinister trespass. And because my own body is the contaminated environment, I cannot extract myself from it. My breasts are important to me. I am a singular beech tree—my favorite tree—holding contamination in my sapwood. I can store it perpetually, or unleash it when I am set ablaze.

For all that we know about breasts, we know very little about their chemical prevalence over generations. Because they do not fossilize, we take our breasts with us. The bodies of my mothers before me, the vessels of my lineage, relinquished to the life-giving earth. What endures is what they have imparted; they survive in the gifts they have spilled.

Milk lines are the bloodlines of women.

Notes

[1] Charles M. Wheeler, "Control of Typhus in Italy 1943-1944 By Use of DDT," *American Journal of the Public's Health and the Nation's Health* 1946: 119.

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